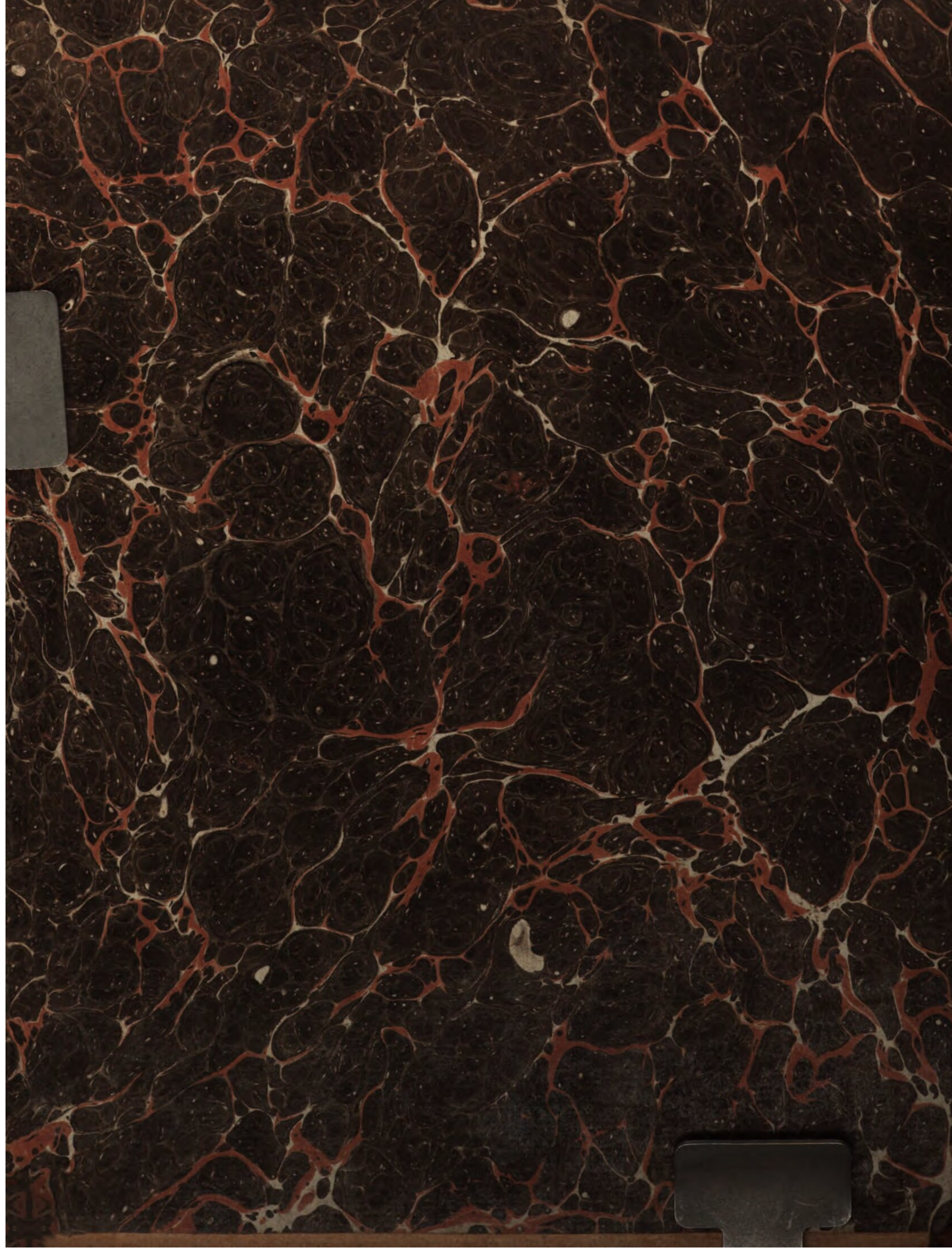
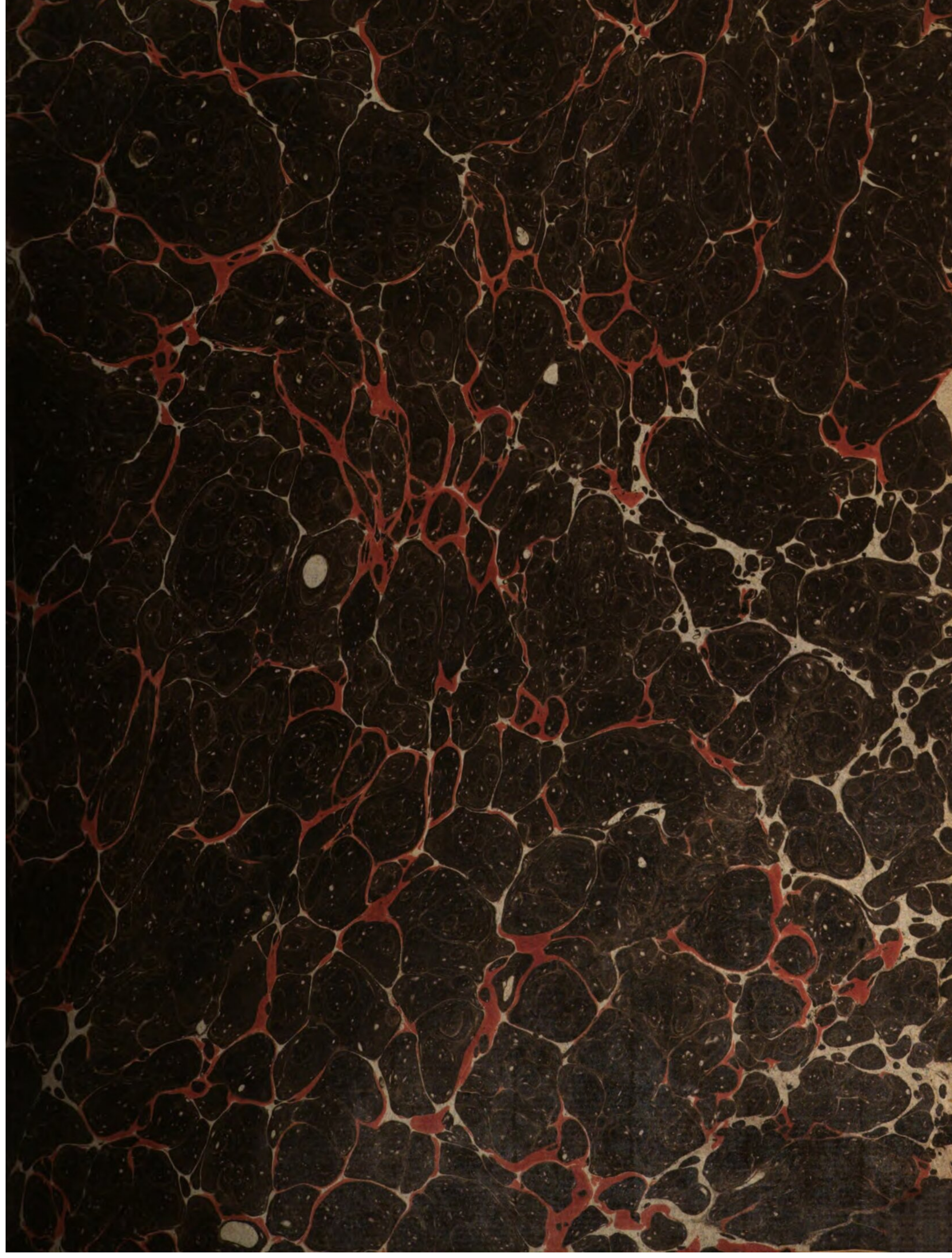














4 Oecon. 78-2



<36605279790011

<36605279790011

Bayer. Staatsbibliothek



4 Oecon. 78-2

*Oeconomia. Agricultura. Systemata & methodi*  
210.

~~Oecon. Agrar. No. 43.~~

R





THE  
LIBRARY  
OF THE  
MUSEUM  
OF  
COMPARATIVE ZOOLOGY  
AT  
HARVARD UNIVERSITY  
CAMBRIDGE, MASS.

1881  
1882  
1883  
1884  
1885  
1886  
1887  
1888  
1889  
1890  
1891  
1892  
1893  
1894  
1895  
1896  
1897  
1898  
1899  
1900  
1901  
1902  
1903  
1904  
1905  
1906  
1907  
1908  
1909  
1910  
1911  
1912  
1913  
1914  
1915  
1916  
1917  
1918  
1919  
1920  
1921  
1922  
1923  
1924  
1925  
1926  
1927  
1928  
1929  
1930  
1931  
1932  
1933  
1934  
1935  
1936  
1937  
1938  
1939  
1940  
1941  
1942  
1943  
1944  
1945  
1946  
1947  
1948  
1949  
1950  
1951  
1952  
1953  
1954  
1955  
1956  
1957  
1958  
1959  
1960  
1961  
1962  
1963  
1964  
1965  
1966  
1967  
1968  
1969  
1970  
1971  
1972  
1973  
1974  
1975  
1976  
1977  
1978  
1979  
1980  
1981  
1982  
1983  
1984  
1985  
1986  
1987  
1988  
1989  
1990  
1991  
1992  
1993  
1994  
1995  
1996  
1997  
1998  
1999  
2000  
2001  
2002  
2003  
2004  
2005  
2006  
2007  
2008  
2009  
2010  
2011  
2012  
2013  
2014  
2015  
2016  
2017  
2018  
2019  
2020  
2021  
2022  
2023  
2024  
2025

LONDON:  
PRINTED BY J. JOHNSON, ST. PAUL'S CHURCH-YARD.  
1851.





G. Garrard. del.

*Dishley Ram.*

*1½ Inch to a foot.*

*Printed for Richard Phillips, 71, St. Paul's Church Yard, Oct. 23. 1804.*



PRACTICAL  
AGRICULTURE;

OR,

*A COMPLETE SYSTEM*

OF

MODERN HUSBANDRY:

WITH THE

METHODS OF PLANTING,

AND THE

*MANAGEMENT OF LIVE STOCK.*

---

BY R. W. DICKSON, M. D.

---

..... Pater ipse colendi

Haud facilem esse viam voluit.

VIRG. GEORG. LIB. 2

---

IN TWO VOLUMES.

VOL. II.

---

LONDON:

PRINTED FOR RICHARD PHILLIPS, No. 71, ST. PAUL'S CHURCH-YARD;

BY R. TAYLOR AND CO. BLACK-HORSE-COURT.

---

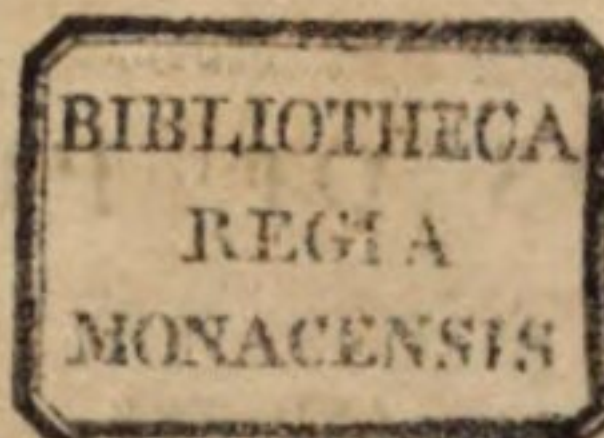
1805.



AGRICULTURE;  
PRACTICAL

A COMPLETE SYSTEM

MODERN HUSBANDRY;



MANAGEMENT OF LIVE STOCK

BY R. W. RICKSON, M.D.

IN TWO VOLUMES

VOL. II

LONDON:

PRINTED FOR RICHARD PHILLIPS, No. 71, ST. PAUL'S CHURCH-YARD,

BY R. TAYLOR AND CO. BLACK-HORSE-COURT.

1863.



# CONTENTS

## OF THE SECOND VOLUME.

### SECTION XI.

#### CULTIVATION OF ARABLE LAND (continued).

|                                         | PAGE. |                                               | PAGE. |
|-----------------------------------------|-------|-----------------------------------------------|-------|
| <b>PEASE</b>                            | 583   | Manner of thrashing them out                  | 802   |
| Beans                                   | 590   | By the flail                                  | ibid. |
| Potatoes                                | 600   | By the thrashing-machine                      | 803   |
| Turnips                                 | 639   | Advantages of each method                     | 804   |
| Cabbages                                | 681   | Preserving of grain                           | 808   |
| Turnip cabbage                          | 695   | Restoring tillage lands to grass              | 813   |
| Turnip-rooted cabbage                   | 698   | Lands most proper for this purpose, ex-       | ibid. |
| Cole or rape                            | 702   | plained                                       | 815   |
| Carrots                                 | 709   | Laying them down to grass                     | 821   |
| Parsnips                                | 718   | Modes of preparation necessary for            | 823   |
| Mangel wurzel                           | 723   | Grasses most suitable, in different cases     | 824   |
| Hemp                                    | 726   | Natural grasses                               | 855   |
| Flax                                    | 733   | Of the artificial kinds                       | 856   |
| Hops                                    | 744   | Clovers                                       | 869   |
| Woad                                    | 765   | Trefoil                                       | 870   |
| Weld                                    | 772   | Saintfoin                                     | 875   |
| Madder                                  | 778   | Lucern                                        | 887   |
| Teasel                                  | 782   | Tares                                         | 894   |
| Liquorice                               | 786   | Vetches                                       | 895   |
| Methods of harvesting the various kinds | 788   | Chicory, &c.                                  | 898   |
| of grain crops                          | 795   | Buck-wheat                                    | 900   |
| Of stacking                             | 799   | Proportion that ought to exist between arable |       |
| Thatching of stacks                     |       | and grass                                     |       |

### SECTION XII.

#### CULTIVATION OF GRASS LAND.

|                              | PAGE. |                                      | PAGE. |
|------------------------------|-------|--------------------------------------|-------|
| <b>GRASS LANDS</b>           | 903   | Times proper for, in different cases | 905   |
| Kinds of                     | ibid. | Removing obstructions to the scythe  | 906   |
| Proper application of        | ibid. | Coarse weeds and plants              | ibid. |
| Meadows, and other hay lands | ibid. | Moss                                 | 908   |
| Difference of management     | 904   | Sticks                               | 909   |
| Clearing from stock          | ibid. | Stones                               | ibid. |



# CONTENTS OF THE SECOND VOLUME.

|                                                                                                                            | PAGE.    |                                                           | PAGE. |
|----------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------|-------|
| Cattle dung-hills . . . . .                                                                                                | 909      | Methods of performing . . . . .                           | 939   |
| Ant-hills . . . . .                                                                                                        | ibid.    | <b>HAY-MAKING</b> . . . . .                               | 940   |
| Mole-hills . . . . .                                                                                                       | 911      | Best methods of . . . . .                                 | ibid. |
| Catching and destroying moles . . . . .                                                                                    | ibid.    | Stacking and thatching hay . . . . .                      | 944   |
| <b>MANURING</b> . . . . .                                                                                                  | 913      | Best methods of performing . . . . .                      | ibid. |
| Proper times for . . . . .                                                                                                 | 914      | Modes of preventing stacks from heating . . . . .         | 945   |
| Kinds of manure . . . . .                                                                                                  | 915      | Stacking-stages . . . . .                                 | ibid. |
| States in which applied with most benefit . . . . .                                                                        | 916      | Hay-sweeps . . . . .                                      | 947   |
| Proportion of, necessary . . . . .                                                                                         | ibid.    | <b>AFTER-GRASS</b> . . . . .                              | 948   |
| Repetition of . . . . .                                                                                                    | ibid.    | Modes of management of . . . . .                          | ibid. |
| Some sorts used as top-dressings cannot be often repeated . . . . .                                                        | 917      | Best application of produce of . . . . .                  | ibid. |
| Chalk, marle, chopped woollen rags, &c. . . . .                                                                            | ibid.    | Pasturing of . . . . .                                    | 949   |
| Capable of being more frequently used in composts . . . . .                                                                | ibid.    | Utility of in this view . . . . .                         | ibid. |
| Lime, with vegetable substances, often employed as top-dressings . . . . .                                                 | 918      | <b>PASTURE LANDS</b> . . . . .                            | 951   |
| Peat-ashes, coal-ashes, and soot . . . . .                                                                                 | ibid.    | Modes of management in . . . . .                          | 952   |
| Best applied after rain in March . . . . .                                                                                 | ibid.    | Removal of obstacles to pasturage . . . . .               | ibid. |
| Setting out manures . . . . .                                                                                              | ibid.    | Methods of improvement of . . . . .                       | 953   |
| Attention necessary in . . . . .                                                                                           | ibid.    | Different modes of application of . . . . .               | 954   |
| Mr. M'Donald's contrivance for . . . . .                                                                                   | ibid.    | Modes of stocking and feeding down . . . . .              | ibid. |
| Spreading of, . . . . .                                                                                                    | 919      | Circumstances to be attended to in . . . . .              | 955   |
| Bush-harrowing . . . . .                                                                                                   | ibid.    | <b>DRINKING-PONDS</b> . . . . .                           | 963   |
| Rolling . . . . .                                                                                                          | 920      | Utility of for cattle . . . . .                           | ibid. |
| Proper times for . . . . .                                                                                                 | ibid.    | Methods of forming of . . . . .                           | 964   |
| Methods of restoring grass-lands . . . . .                                                                                 | 921      | Mr. Marshall's calculation of expences of . . . . .       | 965   |
| <b>WATERED MEADOWS</b> . . . . .                                                                                           | ibid.    | Construction of, by Mr. Billingsley . . . . .             | 966   |
| Nature of . . . . .                                                                                                        | ibid.    | <b>COW KEEPING</b> . . . . .                              | 967   |
| Situations and soils proper for . . . . .                                                                                  | 922,923  | Modes of management in . . . . .                          | ibid. |
| Methods of forming . . . . .                                                                                               | 924      | Cows proper for . . . . .                                 | 968   |
| Spirit level useful in . . . . .                                                                                           | 925      | Manner of foddering of . . . . .                          | 971   |
| Irrigation or watering . . . . .                                                                                           | ibid.    | <b>MILK</b> . . . . .                                     | 974   |
| Modes of conducting the process . . . . .                                                                                  | ibid.    | Times of milking . . . . .                                | 976   |
| Catch-work watering . . . . .                                                                                              | 930      | Method of selling milk . . . . .                          | ibid. |
| Where capable of application . . . . .                                                                                     | ibid.    | Profit of . . . . .                                       | ibid. |
| Circumstances to be attended to in . . . . .                                                                               | ibid.    | <b>SUCKLING OF CALVES</b> . . . . .                       | 978   |
| Utility often derived in watering from stirring mud in bottoms of mains, and the use of lime or other substances . . . . . | ibid.    | Methods of management in . . . . .                        | 979   |
| Causes of the beneficial effects of watering . . . . .                                                                     | 931      | Advantages of . . . . .                                   | 982   |
| Vast utility of . . . . .                                                                                                  | ibid.    | <b>REARING OF CALVES</b> . . . . .                        | 983   |
| Proper seasons for . . . . .                                                                                               | 933      | Attention necessary in, to have good live stock . . . . . | ibid. |
| Lengths of time for continuing it . . . . .                                                                                | ibid.    | Best methods of practice in different districts . . . . . | 984   |
| Mr. Wright's opinion of . . . . .                                                                                          | ibid.    | <b>WEANING OF CALVES</b> . . . . .                        | 986   |
| Mr. Boswell's . . . . .                                                                                                    | ibid.    | Attention necessary to wean early . . . . .               | ibid. |
| Circumstances to be regarded in eating down watered lands . . . . .                                                        | 934      | Best methods of . . . . .                                 | ibid. |
| Useful in producing early grass . . . . .                                                                                  | ibid.    | Young stock should always be well fed . . . . .           | 990   |
| Mr. Templer's improvements by watering . . . . .                                                                           | 936 note | <b>DAIRYING</b> . . . . .                                 | ibid. |
| Improvements by, in Yorkshire . . . . .                                                                                    | 937 note | Lands proper for different kinds of . . . . .             | ibid. |
| In Cheshire, by Mr. Fenna . . . . .                                                                                        | 938      | Proper modes of conducting of . . . . .                   | ibid. |
| <b>WARPING</b> , a practice in Lincolnshire . . . . .                                                                      | ibid.    | Convenient dairy-houses useful . . . . .                  | 992   |
| Only slightly useful on grass-lands . . . . .                                                                              | ibid.    | Proper sorts of cows for . . . . .                        | 993   |
| <b>MOWING</b> . . . . .                                                                                                    | ibid.    | Must always be well foddered . . . . .                    | 994   |
| Proper periods for . . . . .                                                                                               | ibid.    | Kinds of food proper for winter and summer . . . . .      | 996   |
|                                                                                                                            |          | Times of milking . . . . .                                | 998   |
|                                                                                                                            |          | Proper management of milk . . . . .                       | 999   |
|                                                                                                                            |          | Churning . . . . .                                        | 1006  |
|                                                                                                                            |          | Making butter . . . . .                                   | 1007  |
|                                                                                                                            |          | What necessary in these operations . . . . .              | ibid. |



# CONTENTS OF THE SECOND VOLUME.

|                                               | PAGE.       |                                                | PAGE.      |
|-----------------------------------------------|-------------|------------------------------------------------|------------|
| Quantity of produce in                        | . 1008      | Should not be planted too deep                 | . 1068     |
| Cheese                                        | . 1009      | Best seasons for                               | . ibid.    |
| Processes in making of                        | . ibid.     | Methods of pruning                             | . 1069     |
| What necessary in the various operations      | . 1010, &c. | Causes of blights, &c.                         | . ibid.    |
| of                                            | . 1010, &c. | Manner of keeping the fruit for cyder          | . 1070     |
| Advantage of dairying in general              | . 1022      | Process of making it                           | note ibid. |
| <b>GRAZING</b>                                | . 1024      | Produce in the apple and pear                  | . 1072     |
| Lands most proper for                         | . ibid.     | Advantages of the culture of apples and pears  | . 1073     |
| Methods of stocking of                        | . ibid.     | <b>TIMBER KIND</b>                             | . ibid.    |
| Sorts of animals for, in different cases      | . 1025      | Soils proper for                               | . 1074     |
| Neat cattle                                   | . 1027      | Kinds of trees suitable for different cases of | . 1076     |
| Sheep                                         | . 1028      | Oak; ash; elm; mountain-ash; beech;            |            |
| Lambs                                         | . 1031      | sycamore; fir; larch; poplar;                  |            |
| Systems of management in each                 | . 1032      | willow; osier, &c.                             | . ibid.    |
| Horses                                        | . 1037      | Best sizes of, for planting                    | . 1077     |
| Hogs                                          | . ibid.     | Manner of raising in the nursery               | . ibid.    |
| Advantages of each                            | . 1039      | Distances at which planted                     | . 1079     |
| <b>SOILING AND STALL-FEEDING</b>              | . ibid.     | Preparation of land for                        | . ibid.    |
| Soiling                                       | . ibid.     | Manner of planting in different situations     | . 1081     |
| Vast advantage of, in saving of food          | . 1041      | In belts, stripes, clumps, &c.                 | . ibid.    |
| What necessary to regard in                   | . 1042      | Method of mixing the plants                    | . 1082     |
| Methods of foddering employed in              | . 1043      | Warmth necessary in raising                    | . ibid.    |
| Stall-feeding                                 | . 1045      | Methods of planting out                        | . 1083     |
| Kinds of food employed in                     | . 1046      | Should be kept clean afterwards                | . 1086     |
| Methods of feeding                            | . 1047      | Filling up vacancies                           | . ibid.    |
| Proportions of food consumed                  | . 1049      | <b>HEDGE-ROW TIMBER</b>                        | . ibid.    |
| Advantages of different sorts of food         | . ibid.     | Trees larger in these cases                    | . 1087     |
| <b>HOUSE-LAMB SUCKLING</b>                    | . 1054      | Proper pruning of                              | . 1088     |
| Convenient lamb-houses necessary for          | . 1056      | Methods of thinning in plantations             | . 1089     |
| Breeds of ewes proper in                      | . 1057      | In underwoods                                  | . ibid.    |
| Manner of feeding ewes in                     | . ibid.     | Osiers                                         | . 1090     |
| Management in suckling-houses                 | . ibid.     | Methods of planting and culture in             | . ibid.    |
| Advantages of this practice                   | . 1058      | Profits of                                     | . ibid.    |
| <b>PLANTING</b>                               | . 1059      | Willow advantageous in some situations         | . 1091     |
| Cases in which useful                         | . ibid.     | <b>WOODS</b>                                   | . ibid.    |
| Soils adapted to                              | . ibid.     | Management necessary in                        | . ibid.    |
| Kinds of trees proper for, in different cases | . 1060      | Causes of decay of                             | . ibid.    |
| <b>FRUIT KIND</b>                             | . ibid.     | Modes of filling up                            | . 1093     |
| Apple                                         | . 1061      | Times and methods of cutting osier             | . 1094     |
| Pear                                          | . 1064      | In Buckinghamshire                             | . 1095     |
| Soils suited to                               | . ibid.     | In Worcestershire                              | . ibid.    |
| Aspects most favourable for                   | . ibid.     | In Herefordshire                               | . ibid.    |
| Sorts proper for cyder and perry              | . 1065      | In Staffordshire                               | . ibid.    |
| Methods of planting                           | . ibid.     | Time of cutting over in underwoods             | . 1096     |
| Proper distances for                          | . 1066      | Manner of performing the work                  | . 1097     |



# CONTENTS OF THE SECOND VOLUME.

## SECTION XIII.

### LIVE STOCK.

|                                                                                      | PAGE. |                                                                                                                                             | PAGE.      |
|--------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------|------------|
| LIVE STOCK, Importance of . . .                                                      | 1100  | Early maturity: advantages of, to the farmer                                                                                                | 1110       |
| Great attention to . . .                                                             | ibid. | Circumstances most favourable to . . .                                                                                                      | ibid.      |
| Further improvement of, necessary . . .                                              | ibid. | Good feeding and warmth while young . . .                                                                                                   | ibid.      |
| Additional facts and experiments wanting for . . .                                   | 1101  | Quality of flesh probably depends on breed, and not on size of animal . . .                                                                 | 1111       |
| Circumstances to be attended to in . . .                                             | ibid. | Goodness of flavour, in some measure, on food . . .                                                                                         | ibid.      |
| Shelter and warmth, with a high degree of fertility of pasture, useful . . .         | ibid. | Badness of colour, perhaps morbid . . .                                                                                                     | ibid.      |
| Systems of practice pursued in, different . . .                                      | ibid. | Appearances of good meat . . .                                                                                                              | ibid.      |
| Crossing the breeds . . .                                                            | ibid. | Effects of difference of age on the appearance . . .                                                                                        | ibid.      |
| Supposed advantages and disadvantages of this method . . .                           | ibid. | Disposition to fatten, highly necessary to be attended to . . .                                                                             | 1112       |
| Though useful, should be practised with caution . . .                                | 1103  | Principle of, not fully investigated . . .                                                                                                  | ibid.      |
| Injury easily done by it when injudiciously performed . . .                          | ibid. | Much influenced by form of breed, in Mr. Bakewell's practice . . .                                                                          | ibid.      |
| Various proofs of . . .                                                              | ibid. | Advantage and disadvantage of too much fattening . . .                                                                                      | ibid.      |
| Breeding in-and-in . . .                                                             | ibid. | Fattening the only means of procuring good lean meat . . .                                                                                  | 1113       |
| Advantages of this method . . .                                                      | 1104  | Much attention to this property necessary in raising live stock . . .                                                                       | ibid.      |
| What necessary to be regarded in . . .                                               | ibid. | Hide . . .                                                                                                                                  | ibid.      |
| Principal object of the farmer:—profit . . .                                         | ibid. | Necessary feel of . . .                                                                                                                     | ibid.      |
| Form of animal most proper for . . .                                                 | ibid. | Utility of, in exposed situations . . .                                                                                                     | ibid.      |
| Properties to be regarded in . . .                                                   | 1105  | Property of supplying milk largely . . .                                                                                                    | ibid.      |
| Shape . . .                                                                          | ibid. | Nature of animal for . . .                                                                                                                  | ibid.      |
| What necessary in . . .                                                              | ibid. | Should probably be an exclusive breed for Sir John Sinclair's opinion of a breed suited for this purpose, and for that of the grazier . . . | 1114       |
| Most perfect kind of . . .                                                           | ibid. | Aptitude for labour, a property necessary in certain circumstances . . .                                                                    | ibid.      |
| Which most advantageous in the view of the grazier . . .                             | ibid. | What proper to be considered in . . .                                                                                                       | ibid.      |
| The most perfect probably best . . .                                                 | 1106  | Blood, or inherent quality of a breed . . .                                                                                                 | ibid.      |
| Size . . .                                                                           | ibid. | Utility and advantages of, in breeding animals . . .                                                                                        | ibid.      |
| Question concerning, not fully settled . . .                                         | ibid. | Much regard necessary to these properties in breeding . . .                                                                                 | ibid.      |
| Opinions differ, from the quantity of food consumed not being well ascertained . . . | ibid. | Modes of conducting the business . . .                                                                                                      | ibid.      |
| A number of small animals consume less than of large ones . . .                      | 1107  | Success of, on what depends . . .                                                                                                           | ibid.      |
| Mr. Knight's opinion favourable to large size for fattening . . .                    | ibid. | Choice of live stock . . .                                                                                                                  | ibid.      |
| Consumption of food not in proportion to size . . .                                  | ibid. | Various circumstances to be considered in . . .                                                                                             | ibid.      |
| Advantages of small-sized animals . . .                                              | 1108  | Vast advantage of improving live stock, shown                                                                                               | 1116       |
| Smaller sizes best for milk . . .                                                    | 1109  | NEAT CATTLE . . .                                                                                                                           | 1117       |
| Sizes must be much regulated by pasture or herbage . . .                             | 1110  | Breeds of, very numerous . . .                                                                                                              | ibid.      |
| On rich pastures, large breeds most profitable . . .                                 | ibid. | No perfect arrangement of . . .                                                                                                             | ibid.      |
| On inferior ones, the smaller sorts . . .                                            | ibid. | Methods that have been attempted in . . .                                                                                                   | ibid.      |
| Tameness of disposition; great utility of, in domestic animals . . .                 | ibid. | By the horns . . .                                                                                                                          | note ibid. |
| Hardiness, a desirable property in . . .                                             | ibid. | By the names of the counties or districts where they prevail most . . .                                                                     | ibid.      |
| Marks of . . .                                                                       | ibid. |                                                                                                                                             |            |



# CONTENTS OF THE SECOND VOLUME.

|                                                | PAGE. |                                                | PAGE. |
|------------------------------------------------|-------|------------------------------------------------|-------|
| Different breeds described : long-horned       | 1118  | Attention necessary to this and other pro-     |       |
| Middle-horned                                  | 1119  | perties in improvement of sheep-breeds         | 1135  |
| Short-horned                                   | 1121  | Different breeds described                     | ibid. |
| Welsh breed                                    | ibid. | New-Leicester and Dishley breed                | ibid. |
| Suffolk Dun breed                              | 1122  | Lincolnshire breed                             | 1136  |
| Polled or Galloway breed                       | ibid. | Tees-water breed                               | 1137  |
| Kyloe breed                                    | 1123  | Romney-marsh breed                             | 1138  |
| Fifeshire breed                                | 1124  | Dartmoor breed                                 | ibid. |
| Alderney breed                                 | ibid. | Exmoor breed                                   | 1139  |
| Wild breed                                     | ibid. | Dorsetshire breed                              | ibid. |
| Different breeds proper for different purposes |       | Herefordshire breed                            | ibid. |
| of the farmer                                  | 1125  | South-Down breed                               | 1140  |
| Circumstances to be regarded in this in-       |       | Norfolk breed                                  | 1141  |
| tention                                        | ibid. | Heath breed                                    | 1142  |
| Cow stock                                      | 1127  | Herdwick breed                                 | ibid. |
| Means of providing good sort of                | ibid. | Cheviot breed                                  | 1143  |
| Breeding and rearing young stock ; what        |       | Dun-faced breed                                | ibid. |
| necessary in                                   | ibid. | Shetland breed                                 | ibid. |
| Farms proper for                               | ibid. | Merino or Spanish breed                        | 1144  |
| Best methods of, in different circum-          |       | What breeds most suitable under different      |       |
| stances                                        | ibid. | circumstances of soil, climate, and            |       |
| Kinds of food most advantageous for            | ibid. | situation                                      | ibid. |
| Winter management of                           | 1228  | With the intention of profit from the carcase  | ibid. |
| Manner of foddering of                         | ibid. | From the wool                                  | ibid. |
| Question of being tied up, or loose, con-      |       | Mr. Marshall's opinion of different breeds in  |       |
| sidered                                        | ibid. | respect to different manufactures              | ibid. |
| Proper age of putting heifers to the bull      | 1129  | Circumstances to be regarded in intro-         |       |
| Best season for calving                        | 1130  | duction of                                     | ibid. |
| In-calf stock should be well fed               | ibid. | Fine wool may be obtained without injury to    |       |
| Bulls                                          | ibid. | the mutton                                     | 1145  |
| Duration of vigour of                          | ibid. | Putting rams to ewes                           | 1146  |
| Should be well supplied with food in rear-     |       | Proper selection of ewes for                   | ibid. |
| ing                                            | 1131  | Proper time for                                | ibid. |
| Mr. Bakewell's practice in                     | ibid. | Late duke of Bedford's practice in             | ibid. |
| Oxen for labour                                | ibid. | Best age for                                   | ibid. |
| Proper management of in Herefordshire          |       | Necessary system of management of sheep in     |       |
| and Devonshire                                 | ibid. | different circumstances                        | ibid. |
| Time of bringing into work                     | ibid. | In winter                                      | ibid. |
| Best modes of shoeing                          | 1132  | Proper keep while in lamb                      | 1147  |
| Age of cattle, how ascertained                 | ibid. | Great attention to, necessary at lambing-      |       |
| Diseases of cattle, and remedies proper for    | 1133  | time                                           | ibid. |
| Scourings                                      | ibid. | Necessary provision of food for                | ibid. |
| Yellows                                        | ibid. | Utility of turnips in this way                 | ibid. |
| Bloody urine                                   | ibid. | Modes of eating of, with most advantage        | 1148  |
| Foul                                           | ibid. | Lands much improved by                         | ibid. |
| Garget                                         | ibid. | In good breeds, bran and oil-cake useful       | ibid. |
| Wounds                                         | ibid. | Baiting with hay necessary                     | ibid. |
| SHEEP                                          | ibid. | Cotting, great utility of                      | ibid. |
| Importance of, in different views              | ibid. | Brought through winter well in this way        | 1149  |
| Nature of, in different kinds                  | 1134  | Preserved grass ; vast benefit of for this use |       |
| Distinguished into different classes or breeds |       | in early spring                                | ibid. |
| in different ways                              | ibid. | Watered meadows may be depended on,            |       |
| According to the nature of their wool, the     |       | where sufficiently extensive                   | ibid. |
| situations in which they are chiefly           |       | Other means of support                         | ibid. |
| found, or their particular proper-             |       | Turnip-shoots                                  | 1150  |
| ties                                           | ibid. | Ray-grass and clover ; Mr. Young's             |       |
| Standard form of, in the ram                   | ibid. | opinion of these                               | ibid. |



# CONTENTS OF THE SECOND VOLUME.

|                                                 | PAGE.      |                                                     | PAGE.     |
|-------------------------------------------------|------------|-----------------------------------------------------|-----------|
| Cabbages better in April . . . . .              | 1150       | Skit . . . . .                                      | 1169      |
| Turnip-cabbage . . . . .                        | ibid.      | Common salt, its uses in preventing diseases        |           |
| Ruta бага . . . . .                             | ibid.      | in sheep . . . . .                                  | 1170      |
| Boorcole, importance of . . . . .               | ibid.      | HORSES . . . . .                                    | ibid.     |
| Burnet, great use of . . . . .                  | ibid.      | Utility and advantages of, in different views       | ibid.     |
| Turning upon the pastures . . . . .             | ibid.      | Breeds employed in the business of hus-             |           |
| What necessary in . . . . .                     | ibid.      | bandry . . . . .                                    | ibid.     |
| Best methods of . . . . .                       | ibid.      | Different breeds described . . . . .                | ibid.     |
| Attention to the fly necessary . . . . .        | 1151       | Blood-horse, too fine . . . . .                     | ibid.     |
| Weaning the lambs . . . . .                     | ibid.      | Cleveland bays . . . . .                            | 1171      |
| Best modes of . . . . .                         | ibid.      | Suffolk punches . . . . .                           | ibid.     |
| Proper feed should be provided for . . . . .    | ibid.      | Clydesdale horses . . . . .                         | ibid.     |
| Ewes to be kept at a distance . . . . .         | ibid.      | Heavy blacks . . . . .                              | ibid.     |
| Advantages of dividing flocks into different    |            | Welsh and Scotch horses . . . . .                   | 1172      |
| parcels . . . . .                               | ibid.      | Farm horses should be selected from the first       |           |
| Management in down and mountain sheep . . . . . | ibid.      | three kinds . . . . .                               | ibid.     |
| Salving; smearing . . . . .                     | 1154       | Heavy kinds less used from the introduction         |           |
| Inutility of the practice . . . . .             | 1155, note | of the blood sort . . . . .                         | ibid.     |
| Profit of sheep in various cases . . . . .      | 1156       | Breeding can only be attempted under cer-           |           |
| In Mr. Macro's estimate . . . . .               | ibid.      | tain circumstances . . . . .                        | ibid.     |
| In Mr. Ellman's . . . . .                       | ibid.      | Method of management in . . . . .                   | ibid.     |
| In the duke of Grafton's . . . . .              | ibid.      | Time of putting mares to the horse . . . . .        | 1173      |
| Folding . . . . .                               | 1157       | Importance of having foals early . . . . .          | ibid.     |
| Mr. Young's objection to, in certain cases      | ibid.      | Time of going with foal . . . . .                   | ibid.     |
| Cause of practice of . . . . .                  | 1158       | Should be well kept during . . . . .                | ibid.     |
| Advantage of, in sheep-yards . . . . .          | 1159       | Care to be taken in working of . . . . .            | ibid.     |
| On tillage lands . . . . .                      | 1161       | Modes of rearing the foals . . . . .                | ibid.     |
| SHEARING SHEEP . . . . .                        | ibid.      | System pursued when breeding is not prac-           |           |
| Best method of washing . . . . .                | 1162       | tised . . . . .                                     | 1174      |
| Circular method of clipping, an improvement     | 1163       | Time and method of castrating . . . . .             | 1175      |
| Origin of . . . . .                             | ibid.      | Practice in Yorkshire . . . . .                     | ibid.     |
| Introduction of, by the earl of Egremont,       |            | Mode of breaking of . . . . .                       | ibid.     |
| late duke of Bedford, and Mr. Coke              | ibid.      | Making up young horses for sale . . . . .           | 1176      |
| Management of . . . . .                         | ibid.      | Question of the comparative utility of horses       |           |
| Expences of . . . . .                           | ibid.      | or oxen as teams . . . . .                          | ibid.     |
| Winding the wool . . . . .                      | ibid.      | Cases in which each kind may be useful              | 1177      |
| Frequent clipping . . . . .                     | 1164       | Best method of feeding teams . . . . .              | ibid.     |
| Effects of . . . . .                            | ibid.      | Various estimates . . . . .                         | 1177 note |
| Clothing sheep . . . . .                        | ibid.      | Means of lessening expence of keeping of . . . . .  | 1180      |
| Effects of, not fully shown . . . . .           | ibid.      | Utility of bruising the oats . . . . .              | 1181      |
| Time of clipping lambs . . . . .                | 1165       | Barley may be employed with advantage               | ibid.     |
| Of castrating them . . . . .                    | ibid.      | Feeding ox-teams . . . . .                          | ibid.     |
| Produce in wool different in different breeds   | ibid.      | Working of teams . . . . .                          | 1182      |
| Qualities of, adjusted by wool-staplers         | ibid.      | What useful in . . . . .                            | ibid.     |
| Qualities necessary for shepherds . . . . .     | 1166       | Different utility of the stable and the shed system | 1184      |
| Modes of determining age of sheep . . . . .     | ibid.      | Expences of different teams differ much . . . . .   | 1185      |
| Diseases of sheep . . . . .                     | ibid.      | Necessary proportion of teams to the extent         |           |
| Fly . . . . .                                   | ibid.      | of land in different sorts of farms . . . . .       | ibid.     |
| Foot-rot . . . . .                              | 1167       | Ass and mule teams, where useful . . . . .          | 1186      |
| Scab . . . . .                                  | ibid.      | Diseases of horses . . . . .                        | 1187      |
| Rubbers . . . . .                               | ibid.      | Wounds . . . . .                                    | ibid.     |
| Blindness . . . . .                             | ibid.      | Bruises . . . . .                                   | ibid.     |
| Rot . . . . .                                   | 1168       | Strains . . . . .                                   | ibid.     |
| Turn, or giddy . . . . .                        | ibid.      | Warble tumours . . . . .                            | 1188      |
| Resp, or red-water . . . . .                    | 1169       | Colds . . . . .                                     | ibid.     |
| Braxy . . . . .                                 | ibid.      | Colics . . . . .                                    | ibid.     |
| Black-water . . . . .                           | ibid.      | Staggers . . . . .                                  | ibid.     |



# CONTENTS OF THE SECOND VOLUME.

|                                                                                | PAGE.      |                                                     | PAGE. |
|--------------------------------------------------------------------------------|------------|-----------------------------------------------------|-------|
| Strangles                                                                      | 1188       | Diseases of hogs                                    | 1202  |
| Yellows                                                                        | 1189       | Mange                                               | ibid. |
| Worms                                                                          | ibid.      | Crack in ears                                       | 1203  |
| Bots                                                                           | ibid.      | Swellings in udders                                 | ibid. |
| Glanders                                                                       | ibid.      | RABBITS                                             | ibid. |
| Farcy                                                                          | ibid.      | Where kept with advantage                           | ibid. |
| Grease                                                                         | 1190       | Proper breeds of for warrens                        | ibid. |
| Mange                                                                          | ibid.      | Methods of managing of                              | ibid. |
| SWINE                                                                          | 1191       | Statements of profit of                             | 1204  |
| Proper form of                                                                 | ibid.      | Modes of taking by nets and traps                   | 1205  |
| Large breeds of                                                                | ibid.      | POULTRY                                             | 1206  |
| Berkshire                                                                      | ibid.      | Where usefully kept                                 | ibid. |
| Hampshire                                                                      | ibid.      | Fowls                                               | ibid. |
| Shropshire                                                                     | ibid.      | Different breeds of                                 | ibid. |
| Gloucestershire                                                                | ibid.      | Proper conveniences for                             | ibid. |
| Herefordshire                                                                  | ibid.      | Management of in setting, breeding, rearing,        |       |
| Largest breed of                                                               | ibid.      | and fattening of                                    | 1207  |
| Small breeds of                                                                | 1192       | Expences of                                         | 1209  |
| Chinese                                                                        | ibid.      | Mr. Boys's system of management of                  | ibid. |
| White                                                                          | ibid.      | Diseases of                                         | 1210  |
| Swing-tailed                                                                   | ibid.      | Guinea fowl                                         | ibid. |
| What necessary in the breeding of                                              | ibid.      | Uses of                                             | ibid. |
| Utility of convenient sties                                                    | ibid.      | Turkey                                              | ibid. |
| Circular form of, advised by Mr. Young                                         | ibid.      | Breeds of                                           | ibid. |
| Advantages of                                                                  | 1193       | Proper management of                                | ibid. |
| Expence of building of                                                         | note ibid. | Reason of fineness of in Norfolk                    | 1211  |
| Age of putting to boar                                                         | 1194       | Living and dead weights of                          | ibid. |
| Produce of                                                                     | ibid.      | WATER FOWL                                          | ibid. |
| Best seasons for rearing                                                       | ibid.      | DUCKS                                               | ibid. |
| Different sorts should be kept separate                                        | 1195       | Kinds of                                            | ibid. |
| Proper sorts of food to be provided in abundance                               | ibid.      | Best modes of management of                         | 1212  |
| Crops proper for, in this view                                                 | ibid.      | Utility of in destroying worms, slugs, &c. on       |       |
| Proper proportions of                                                          | ibid.      | grain crops                                         | 1213  |
| Modes of feeding different sorts of                                            | ibid.      | GEESE                                               | ibid. |
| With dairy-wash                                                                | ibid.      | Kinds of                                            | ibid. |
| Other sorts of wash                                                            | ibid.      | Proper modes of hatching and rearing of             | ibid. |
| Pea-soup                                                                       | 1196       | Manner of plucking of                               | 1214  |
| Boiled and other roots, cabbages, &c.                                          | ibid.      | Methods of fattening of                             | 1215  |
| Soiling hogs more beneficial                                                   | 1196       | PIGEONS                                             | ibid. |
| Lettuces useful for sows with pigs                                             | 1197       | Where kept with advantage                           | ibid. |
| Mode of cultivating them for                                                   | ibid.      | Best management of                                  | 1216  |
| More sows capable of being kept in this management than under the dairy system | 1198       | Dovecotes should be kept clean and free from vermin | 1217  |
| Best periods of selling in this management                                     | ibid.      | BEES                                                | ibid. |
| Expence of store-keeping of, various                                           | ibid.      | May be kept with advantage in some cases            | 1218  |
| Advantages of breeding and rearing pigs                                        | ibid.      | Most proper situations for                          | ibid. |
| Fattening                                                                      | ibid.      | Methods of purchasing stocks of                     | 1219  |
| Seasons for                                                                    | ibid.      | Best construction of hives for                      | 1220  |
| Substances used in                                                             | ibid.      | Profits of                                          | 1221  |
| Best means of employing them                                                   | 1199       | FISH-PONDS                                          | ibid. |
| Advantage of different sorts of food in the production of pork                 | ibid.      | Advantageous in some cases                          | ibid. |
| Pigs pay for keep equally well as other sorts of stock                         | 1201       | Methods of constructing of                          | 1222  |
| Modes of curing bacon, pork, and hams                                          | ibid.      | Expences of                                         | ibid. |
|                                                                                |            | Manner of stocking of, in different cases           | 1223  |
|                                                                                |            | With carp                                           | ibid. |
|                                                                                |            | Tench, perch, &c.                                   | 1224  |
|                                                                                |            | Profit of, under different circumstances            | 1225  |



# LIST OF PLATES

## IN THE SECOND VOLUME\*.

### Plate

|                                             |                    |
|---------------------------------------------|--------------------|
| I. Herefordshire Bull.....                  | to face the Title. |
| II. Bean Drill.....                         | to face Page 594   |
| III. Potatoe Harrow .....                   | 630                |
| IV. Turnip Slicers.....                     | 670                |
| V. Sweet-scented Vernal Grass .....         | 824                |
| VI. Meadow Foxtail Grass.....               | 825                |
| VII. Smooth-stalked Meadow Grass.....       | 826                |
| VIII. Rough-stalked Meadow Grass .....      | 827                |
| IX. Meadow Fescue Grass .....               | 827                |
| X. Sheep's Fescue Grass .....               | 828                |
| XI. Hard Fescue Grass.....                  | ibid.              |
| XII. Crested Dog's-tail Grass .....         | ibid.              |
| XIII. Common Ray Grass.....                 | 829                |
| XIV. Rough Cocksfoot Grass .....            | 833                |
| XV. White Clover.....                       | 835                |
| XVI. Trefoil, or Nonsuch.....               | 836                |
| XVII. Bird's-foot Trefoil .....             | ibid.              |
| XVIII. Red Clover .....                     | 856                |
| XIX. Saintfoin .....                        | 870                |
| XX. Lucern .....                            | 876                |
| XXI. Irrigation.....                        | 928                |
| XXII. Watering of Land .....                | 930                |
| XXIII. Watering of Land .....               | ibid.              |
| XXIV. Sussex Bull .....                     | 1120               |
| XXV. Sussex Oxen .....                      | ibid.              |
| XXVI. Herefordshire Oxen.....               | ibid.              |
| XXVII. Dishley Ram .....                    | 1135               |
| XXVIII. Dishley Ewe.....                    | ibid.              |
| XXIX. South Down Ram.....                   | 1140               |
| XXX. South Down Ewe.....                    | ibid.              |
| XXXI. Suffolk Punches .....                 | 1171               |
| XXXII. Horses.....                          | 1172               |
| XXXIII. Swine.....                          | 1191               |
| XXXIV. Machine for weighing Live Stock..... | 1192               |

\* The Descriptions must face the Plates to which their Numbers refer.



# PRACTICAL AGRICULTURE.

## SECTION XI.

### *Cultivation of Arable Land (continued).*

**PEAS.**—This is a crop which is less certain than most others, and even when productive mostly inferior in value, except in particular situations, as near large towns, when produced early for the table, to those of the grain kind. Yet from such crops when full, having much tendency to improve the lands on which they are cultivated, as well as to render them clean and free from weeds, they are cultivated to a considerable extent in many districts of the kingdom. The varieties of peas employed in cultivation are extremely numerous; but those adapted to field culture are generally distinguished into two kinds, the early and the late: of the former are the early *Charlton*, the *golden hotspur*, and the common *white*; of the latter all those of the gray kind, as the *Marlborough gray*, the *horn gray*, the *maple gray*, &c.: the first of these sorts is generally considered the best for field husbandry.

This crop may be grown upon almost any sort of soil, but succeeds best on such as are dry and possess a middling degree of lightness, with a tolerably mellow condition, having a portion of calcareous matter in their composition, as without this ingredient peas are said not to fill or ripen so perfectly. Pea crops are mostly put in after wheat, oats, or other kinds of grain. They may likewise succeed clover or saintfoin in many cases with advantage; and on old ley grounds, when newly broken up, where danger is apprehended from the worm, they may often be found a beneficial crop. But after whatever sort of crop peas may be cultivated, it will generally be necessary to have the soil reduced into a tolerable state of pulverisation before they are put in, and, where it can be spared, a portion of manure applied. For this purpose, a compost of earth, dung and lime may be the most useful, especially where there is little or no calcareous matter in the soil. Pea crops may thus be rendered not only more abundant but better filled, and ripened at an earlier period.



*Time of sowing.*—In sowing this kind of crop, much must depend upon the intentions of the cultivator: when the peas are intended for podding, in order to be sent green to the market, which may be the most advantageous appropriation of the crop near large towns, where they can be readily disposed of, they should be put in succession at the distance of ten days or a fortnight from about the middle of January to the latter end of March, beginning with the lands that are most dry and mellow, and proceeding to such as are more moist and heavy. In this mode of culture regular supplies may be kept up for the daily consumption of the markets. The white early sorts are in these cases to be employed. It is however the practice in some of the southern districts, in order to have them more early, to sow the seed in the autumn, as a little after Michaelmas. This, from the frosts during the winter, is often, however, a dangerous method, and should perhaps never be attempted, except where the land lies extremely dry and warm, and is very rich in quality\*. But for the general crops, when the cultivator has no view of the above kind, they may be sown as early in March as the soil can be put into a proper state of preparation. In these cases the gray sorts are mostly employed. When the seed is put in at a later period, as in April, the white or more early kind should constantly be preferred, as the produce becomes ripe more early, which is a matter of importance in pea crops.

*Seed.*—The proportion of seed must vary according to the difference of the circumstances under which the crop is cultivated, the manner in which it is put in, and the intention with which it is grown. When the seed is put in on rich ground in the autumn, with the design of pulling the pods green, it may be in the quantity of three bushels and a half or four bushels to the acre; a larger proportion than in other cases being generally allowed. The peas in those cases should be put in in rows, at the distance of about three feet from each other, in order that proper cultivation may be applied afterwards. This mode of practice is common about Dartford in Kent, where the green pea system of husbandry is carried on extensively and with much profit to the farmer. But for the general sowings, when the land is in tolerable condition, from three to three bushels and a half is the common allowance, the earlier sowings requiring rather the most seed.

If the view of the cultivator in the growth of pea crops be chiefly that of cleaning and ameliorating the land for the reception of other sorts of crops, as those of grain, turnips, &c. or the producing much straw, a larger quantity of seed may be useful, as by that means the surface of the soil may be more perfectly

\* *Synopsis of Husbandry*, p. 118.



covered, and a more close and stagnated state of the air produced upon it in consequence; at the same time that the plants are drawn up to a greater length of stem or straw, by which the land will be greatly mellowed and enriched, and the small weeds smothered and destroyed at the time that a larger proportion of fodder is produced. But in cases where the principal object is that of the crop of corn that is to follow, the proportion of seed may be less, as in that way there will be a more free circulation of air, and a more perfect admission of light and heat from the sun, for the growth and maturation of the pea crop, and at the same time less exhaustion of the soil. It is usual in these cases, in many districts, to put the seed into the ground in the broadcast method; but the drill or row system is mostly to be preferred, as being more regular, saving considerably in the proportion of seed, and admitting of cultivation afterwards with more ease and advantage. In this last method two bushels, or two bushels and a half, may often be a sufficient allowance of seed. Different implements have been contrived for this use, but the most convenient is probably a small light sort of wheel-plough, to the body of which a sort of seed-box is attached, through the bottom of which the axis of a light wheel passes, by which the sowing is regulated, and which is pulled up and prevented from letting the peas be deposited at the ends of the ridges, or other places, as in turning, by a string attached to the handle. It may be conveniently employed with one or two horses.

The proper distance of drilling this kind of crop is mostly about twelve or sixteen inches for hand-hoeing; but where the horse-hoe is employed, from two to three feet; and the depth to which the seed is deposited, from two to three inches.

In some districts the seed is put by the hand into drills mostly made cross-ways of the ridges, but occasionally in the direction of them, at the distance of about fifteen inches from each other, and afterwards covered in by means of hoes. In some instances also a bush-harrow is drawn over the surface, by which the land is rendered smooth and even\*.

Where this sort of crop is cultivated on a ley preparation, the best method is probably to dibble the seed in. This is the practice constantly followed by the best cultivators in some districts†.

Though the practice of steeping this sort of seed is seldom had recourse to by the cultivators of peas, it is probable that the later sown crops may be greatly

\* Corrected Report of Middlesex, p. 194.

† Corrected Report of Suffolk.



benefited by it, as the vegetation of the plants may be rendered more quick, regular, and uniform.

It is the custom in Hertfordshire, and some other districts, to sow beans, or even oats, sometimes with the peas, with a view of keeping them up. These mixtures are, however, practices that can never be adopted with advantage, as the different crops, from their being of unequal growth, must constantly be liable to injure each other.

*After-culture.*—The use of the hoe in stirring the intervals, and earthing up the young plants where the crop is put in in rows by the drill or dibble, is of essential advantage in promoting their growth, and protecting them from the injuries of the season. Where the method of hand-culture prevails, it is the general custom to have recourse to two hoeings; the first when the plants are about two or three inches in height, and again just before the period in which they come into blossom. In this way the vigorous vegetation of the young crop is secured, and a fresh supply of nourishment afforded for the setting of the pods and the filling of the peas. At the last of these operations, the rows should be laid down, and the earth well placed up to them, the weeds being previously extirpated by hand labour\*.

In some parts of Kent, where this sort of crop is much grown, it is the practice, when the distance of the rows is sufficiently great, to prevent the vegetation of weeds, and forward the growth of the pea crops, by occasional *edge-hoeing*, and the use of the brake-harrow, the mold being laid up to the roots of the plants at the last operation, by fixing a piece of wood to the harrow. This should however only be laid up on one side, the peas being always placed to that which is the most fully exposed to the effects of the sun. The edge-hoeing is performed at the rate of from two to three shillings the acre, according to the nature of the land.

There are many inducements to the cultivation of this crop, on suitable soils, in the vicinity of large towns, where the demand for green peas is considerable; such as the ready supply of money that is thus provided for the other expensive operations during the summer months, the facility of thus rendering the land proper for the growth of turnips, and the large supply of fodder that is afforded by the stems of the plants when properly secured; notwithstanding the danger of such crops during the winter, and even in the spring months, when the seasons prove unfavourable, and the heavy expences incurred in the gathering and disposal of them.

\* Corrected Report of Middlesex,



It is frequently a practice with the large cultivators of early green pea crops, in the neighbourhood of London, to dispose of them, by the acre, to inferior persons, who procure the *podders*; but the smaller farmers for the most part provide this description of people themselves, who generally apply at the proper season for the purpose. The business of picking or podding the peas is usually performed by the labourers at a fixed price for the sack, of four heaped bushels. The number of this sort of persons is generally in the proportion of about four to the acre, the labour proceeding on the Sundays as well as other days. It is sometimes the custom to pick the crops over twice, after which the rest are suffered to stand till they become ripe for the purpose of seed. This, however, mostly arises from the want of pickers, as it is considered as a loss, from the peas being less profitable in their ripe state than when green. Besides, they are often improper for the purpose of seed, as being the worst part of the crop. It is therefore better to have them clear picked when hands can be procured. After this they are loaded into carts, and sent off at suitable times, according to the distance of situation, so as to be delivered to the salesmen in the different markets, from about three to five o'clock in the morning \*. In many cases in other parts the early gatherings are, however, sent to the markets in half-bushel sieves, and are frequently disposed of at the high price of five shillings the sieve; but at the after periods they are usually conveyed in sacks of a narrow form, made for the purpose, which contain about three bushels each, which, in the more early parts of the season, often fetch twelve or fourteen shillings the sack, but afterwards mostly decline considerably, in some seasons so much as scarcely to repay the expences. This sort of crop affords the most profit in such pea seasons as are inclined to be cool, as under such circumstances the peas are most retarded in their maturation or ripening, and of course the markets kept from being overabundantly supplied.

The expence of gathering green peas is different, according to the difficulty of procuring podders, the bulk or abundance of the crops, and the kind of pea or size of the pods. Those of the larger sorts, such as the marrowfats, being in the county of Middlesex about one shilling, and those of the smaller kinds, as the Charlton, from fifteen to eighteen pence, the sack †. In Kent the usual price is about fourteen pence the sack for podding, one shilling for conveying them to the market, and three pence the sack for the salesman ‡.

\* Middleton's Report of Middlesex.

† Ibid.

‡ Synopsis of Husbandry.



The produce of both the early and late pea crops vary much according to the nature of the season, and many other circumstances. The average of the early crops in Middlesex is supposed, by the author of the Report of that district, to be from about twenty-five to thirty sacks the acre, which, selling at from eight to eighteen shillings the sack, afford about eighteen pounds the acre. The author of the Synopsis of Husbandry, however, states the produce about Dartford, in the county of Kent, at about forty sacks the acre, though he says fifty have sometimes been gathered from that space of land\*.

But for the later crops that stand to ripen, it is supposed by some to be from three and a half to four quarters the acre; others however imagine the average of any two crops together not more than about twelve bushels†. And that on the whole, if the value of the produce be merely attended to, it may be considered as a less profitable crop than most others. As a means of ameliorating and improving the soil, at the same time it is, however, to be esteemed as of great value.

The greatest danger to the early pea crops is to be apprehended when the weather during the more early spring months is hot and sunny in the day-time, attended with sharp frosts in the nights, as in this way great mischief is often done, the crops becoming attacked with the mildew, and not ripening in a proper manner.

While the peas are proceeding in their growth, and still more particularly at

\* The produce and expence of cultivation of a field of six acres, in June, 1796, that was not at all remarkable for more than a common crop, are thus stated by Mr. Middleton in his Survey of the Agriculture of Middlesex:

|                                                                                 |           |           |
|---------------------------------------------------------------------------------|-----------|-----------|
| Number, 40 sacks, of four bushels each, of pods sent to market, and sold from   |           |           |
| 6s. to 13s. average 7s. 6d. each                                                | - - - - - | £. 15 0 0 |
| Haulm, stacked, and given to draught horses, one ton per acre, worth two-thirds |           |           |
| as much as hay, but say only                                                    | - - - - - | 3 0 0     |
|                                                                                 |           | <hr/>     |
| Produce                                                                         | - - - - - | £. 18 0 0 |
| <b>EXPENCES.</b> —Ploughing once from clover ley                                |           | £. 0 10 0 |
| Seed, four bushels, at 12s.                                                     | - - - - - | 2 8 0     |
| Drilling, covering, &c.                                                         | - - - - - | 0 7 0     |
| Hoeing twice                                                                    | - - - - - | 0 10 0    |
| Podding at 18d. per sack, on 40                                                 | - - - - - | 3 0 0     |
| Marketing, distance ten miles, land carriage                                    | - - - - - | 1 5 0     |
|                                                                                 |           | <hr/>     |
|                                                                                 |           | 8 0 0     |
|                                                                                 |           | <hr/>     |
| Remains                                                                         | - - - - - | £. 10 0 0 |
|                                                                                 |           | <hr/>     |

† Donaldson's Modern Agriculture.



the periods when they come into blossom and begin to set their pods, it is of great importance to have rather moist weather, as by that means the vegetation of the crop is promoted in a more perfect manner, and there is a greater chance of the peas being well podded. The chief signs of the healthy and vigorous vegetation of pea crops are those of their leaves possessing a fine bloom of a bluish cast, and having the outermost large leaves of the blossom extending backwards\*.

In the late or general pea crops, after they are reaped or rather cut up by means of a hook, it is the usual practice to put them up into small heaps, termed *wads*, which are formed by setting small parcels against each other, in order that they may be more perfectly dried both in the seed and stem, and be kept from being injured by the moisture of the ground. But in the early crops the haulm is hooked up into loose open heaps, which, as soon as they are perfectly dry, are removed from the ground and put into stacks for the purpose of being converted to the food of animals, on which they are said to thrive nearly as well as on hay†. When intended for horses, the best method would seem to be that of having them cut into chaff and mixed with their other food.

It is the practice in some districts to remove the haulm as soon as it has been cut up, by hooks constructed with sharp edges for the purpose, to every fifth ridge, or even into an adjoining grass field, in order that it may be the better cured for use as cattle food, and at the same time allow of the land being immediately prepared for the succeeding crop. What are usually termed winter peas, or such crops as have been sown in the autumn, generally afford the largest proportion of cattle fodder.

It is of considerable importance in the economy of a farm, when the nature of the soil is suitable, to have recourse to the early sorts; as by such means the crops may in many cases be cut and secured while there is leisure, before the commencement of the wheat harvest.

Where the nature of the soil is dry and warm, and the pea crop of a sufficiently forward kind, it may be easy to obtain a crop of turnips from the same land in the same year. But in this view it is the best practice to put the crops in in the row method, and keep them perfectly clean by means of attentive hand and horse hoeing; as in that way the land will be in such a state of preparation for the turnips, as only to require a slight ploughing, which may be done as fast as the pea crop is removed, and the turnip seed harrowed in as quickly as possible upon the newly turned up earth. In some particular districts a third

\* English Encyclopædia, art. Husbandry.

† Corrected Report of Middlesex, p. 285.



crop is even put into the same land, the turnips being sold off in the autumn and replaced by *collards*, for the purpose of greens in the following spring. This, according to Mr. Middleton, is the practice in some places in Middlesex.

It is a method of cultivation that can, however, only be attempted on the warm and fertile kinds of turnip soil, and where the pea crops are early; on the cold heavy and wet descriptions of land, it is obviously impracticable.

With the marrowfat and other late sorts of peas, the usual practice is to either prepare the land for wheat, or to put in crops of favoys or other late sorts of cabbages, which are methods of husbandry that may often be had recourse to, even on the more heavy sorts of land, with success. From pea crops rendering the lands on which they are cultivated more light, open, and porous, they are supposed to be less proper for preceding wheat than those of beans; on the more stiff sorts of ground this cannot, however, be an objection of any great consequence, and even on the lighter kinds it may often be obviated, by giving the seed earth early, so that the crop may be put in upon a stale furrow, by the use of the sheep-fold, either immediately before or after the grain is deposited in the soil, and by repeating the same practice occasionally afterwards, as well as by rolling.

The portion of peas that is not consumed as human food is mostly appropriated to the purposes of fattening hogs and other sorts of domestic animals; and, in particular instances, supplies the place of beans as the provender of labouring horses; but care should be taken, when used in this way, that they be sufficiently dry, as, when given in their green state, they are said to be apt to produce the gripes.

*Beans.*—This is a species of crop that may be cultivated to much advantage on the more heavy wet kinds of land, which are improper for most other sorts of crops, both on account of the utility of the produce, and the improvement that is effected in the nature of such soils; as by this means, as has been already seen, the ground may in many cases be rendered proper for the growth of wheat, without having recourse, as has been usually done, to the uneconomical practice of preparing it by a naked fallow.

There are different kinds of beans cultivated in different districts, according to the intentions of the farmers, and the nature of the soils; but they may be sufficiently distinguished by dividing them into field and garden beans. Of the first sort the common horse-bean is the most generally cultivated on the strong lands, as it is found to grow to a greater height in the stem, and of course to cover the surface of the land more effectually. The tick bean is, however, sup-



posed by some cultivators to afford a larger produce. The large ticks are the sort mostly grown in the county of Kent, where the bean husbandry is practised to some extent; but in Essex, where the system of cultivating beans also prevails in a considerable degree, the small ticks are held in the highest estimation, as on the strong lands of that district they are mostly found to afford an abundant produce. And in the market this is the sort of bean that generally fetches the best price.

Some of the latter or garden kinds have lately been introduced into the field with considerable advantage in particular districts. Of these the mazagan and Mumford, the long-pod, and the Windsor, are the sorts that are in general cultivated. The first is an early kind that does not grow to any great height, seldom more than about two feet. The stem is slender, but mostly well beset with pods, which contain beans of rather a small size. This sort of bean, from its not growing tall, and having but a slender stem, may probably be grown with profit on the less strong and heavy sorts of ground. It has also the property of becoming ripe more early than any of the other garden beans. The Mumford bean is also proper on the same sort of land. But the long-pod is of a much taller growth, and considerably more strength of stem; it consequently requires greater depth and strength of soil for its advantageous culture. It is a sort of bean that affords a large produce where the land is suitable to its growth. The Windsor bean is of a still larger kind than the long-pod, the seed approaching to somewhat the square form. It grows strong and tall like the long-pod kind, but seldom yields so large a produce. These large kinds of beans are rarely, however, cultivated in the field, except in the vicinity of large towns, where they can be sold in the pods green.

This is a sort of crop that may be cultivated with success, as has been seen, on almost any of the stronger kinds of moist soils. It thrives equally well in the stiff clayey lands, and those of the strong loamy kinds. The staple of the lands, where bean crops succeed to the greatest advantage, is generally of a good depth; as in such the roots are enabled to get down so as to be capable of supplying themselves with a suitable proportion of nourishment, which cannot be the case where the ground has a thin staple.

Bean crops are grown after wheat and oats, as well as on such lands as have been newly broken up from the state of ley. On the last they may be cultivated with great propriety and advantage where danger is apprehended of corn crops being injured by the attacks of the grub or other insects. And, besides their utility in this way, they may be of great benefit in cases where the sward is tough, by breaking down and reducing the parts of the soil, as well as in



promoting the putrefaction and decay of the turfy or grassy material, and the destruction of weeds, by the shade and smothering closeness which they produce on the surface of the ground. Though this sort of crop is capable of being cultivated after most sorts of vegetable productions, it seems probable, from its possessing a tap root, and striking deeply into the earth, that it may be grown to the most benefit in succession to such sorts of plants as are of the fibrous-rooted kind.

The common method of preparing the soil for the reception of bean crops is merely by giving one ploughing at the period when the seed is put into the ground in the spring months. But it is a better practice probably to plough the land into ridglets of about two feet six inches in width, as early as possible in the autumn, after the manure has been applied, which should constantly be laid on when beans are sown after grain crops; in which state it should remain until the period at which the beans are to be put in. By the use of a portion of manure in this manner, the crops are rendered more strong and vigorous in their growth, at the same time that the branching of their lateral shoots is considerably promoted.

By this method of ridging up the land in the autumn, and manuring it, on the moist kinds of heavy soils much advantage is produced. This form of ridge preserves the ground dry, and in a healthy condition, during the winter months, and at the same time prevents the manure that is included in the middle of them from being dissolved and washed away by heavy rains; and, in addition, the land is kept in so dry a state at the seed-time, as to afford the cultivator an opportunity of putting in the beans whenever the weather is fair\*.

Where the drill culture is practised, more frequent ploughings will be requisite, in order that the land may be brought into such a state of tilth as that the drill machine may distribute the seed with uniformity.

*Time of sowing.*—The season of putting this crop into the ground must depend in some measure upon the nature of the climate and situation. In the more mild and less exposed places in the southern districts, they may be put into the earth with propriety during the whole of the month of January; and in such as are more exposed, as early in February as the business can be accomplished with propriety. But in the more northern parts of the kingdom, a later period may be more suitable, as in March. When the period of planting is delayed too long, there may often be danger of the crops not being sufficiently

\* Corrected Report of Middlesex.



established in the soil before the weather becomes too hot and parching. And, on the contrary, when they are set too early there may be danger from the frosts, which, when severe, are known to injure them greatly at the time they first shew themselves above the surface of the ground, and when accompanied by sudden thaws to be capable of wholly destroying them\*.

*Seed.*—The proportion of seed that may be necessary, must, of course, be different, according to the nature of the soil, the period of putting the crop into the ground, and the manner in which the business is performed. Where the broadcast method is pursued, and the land is of the medium bean kind, from three and a half to four bushels is the quantity that is most commonly allowed to the acre. This mode of practice should, however, never be attempted when the others can be had recourse to. Under other methods of putting in the beans, a much less proportion of seed is, however, required, the quantity varying according to the distance of planting from two to three bushels and a half to the acre, or in some cases perhaps rather more. When planted in rows at the distance of two and a half feet, the quantity of seed that is most proper has been found to be about two bushels to the acre; but when put in rows at the distance of only fifteen inches, it will be three and a half bushels, or perhaps rather more†.

The manner of putting this crop into the soil differs considerably in different districts. In some the method of sowing broadcast is still in use; but in this the seed is liable to be left uncovered on the surface of the land, or covered so lightly that the bean plants are incapable of vegetating in a proper manner, from which the crop often becomes weak and feeble in its early growth, and seldom acquires proper strength afterwards. Besides, in this method, from the irregularity of the crop, there is great danger of its being injured by the growth of weeds, as they cannot be conveniently destroyed by the hoe.

It is the custom in some of the more southern districts to plant this kind of crop in rows, by means of a line and dibble, which, though an expensive practice, is greatly preferable to the above, both in admitting of the land being kept clean, and in the economy of seed. In this way the rows are usually marked out to the distance of a foot from each other, and the beans deposited in holes about two inches apart, the lines being stretched across the ridges, which are formed of different breadths, according to the circumstances of the land, but in many cases about six feet over. In this mode, after one row is

\* Corrected Report of Middlesex.

† Ibid.



planted, the pegs to which the lines are attached are moved exactly to the distance that is requisite until the whole field is finished. The expence of this mode of setting beans is generally about nine pence or a shilling the peck. In some places it is done by the gallon at the rate of about four pence. In performing this business care must constantly be taken by the employer to see that the beans are regularly deposited in the holes, and not thrown away or otherwise wasted, in order to obtain greater wages. After the beans are thus deposited, a bush-harrow, drawn by horses in the furrows, is generally passed over the ground in order to cover them. The Kentish farmers have however a much neater and more expeditious method of sowing beans, which is, to strike out furrows in the proportion of about eleven to a rod in breadth, in which the seed is thinly deposited by means of a sowing-box, which is held by a person following the striking plough, and who, by slightly agitating it when filled with beans, drops them with regularity into the furrows as they are formed. The seed is then covered by harrowing down the inequalities of the ground. It is stated that in this method, with two men and two or three horses to the plough, a person to manage the box, and a boy with two horses to perform the business of harrowing, the space of three acres may be completed in the course of a day\*.

In accomplishing this business, it is, however, the custom of some agricultors to make use of a drill plough; but as beans are liable to considerable inequality of size, they are seldom delivered in a sufficiently regular manner from the hopper, large beans occasionally interrupting the sowing in such a way as to render the crop vacant or uneven in different places, defects which the picking of the seed over is not even capable of removing. In speaking of Implements, drills have however been described that seem to deposit the beans with much correctness.

In the sowing of this sort of crop, experiment has shewn that, on the poor and more moist kinds of loamy soils broken up from the state of ley, it may frequently be more advantageous to put the beans into the ground in rows at nine inches, or on every furrow, than at eighteen inches or every other furrow, though on rich fertile tillage lands the latter may often be the most proper, or even still larger distances in some cases†.

From the nature of the root of the bean plant, it has been inferred, that it should constantly be planted to a good depth in the soil, not less than five or six inches below the settled surface of the land, as by the lateral fibres which con-

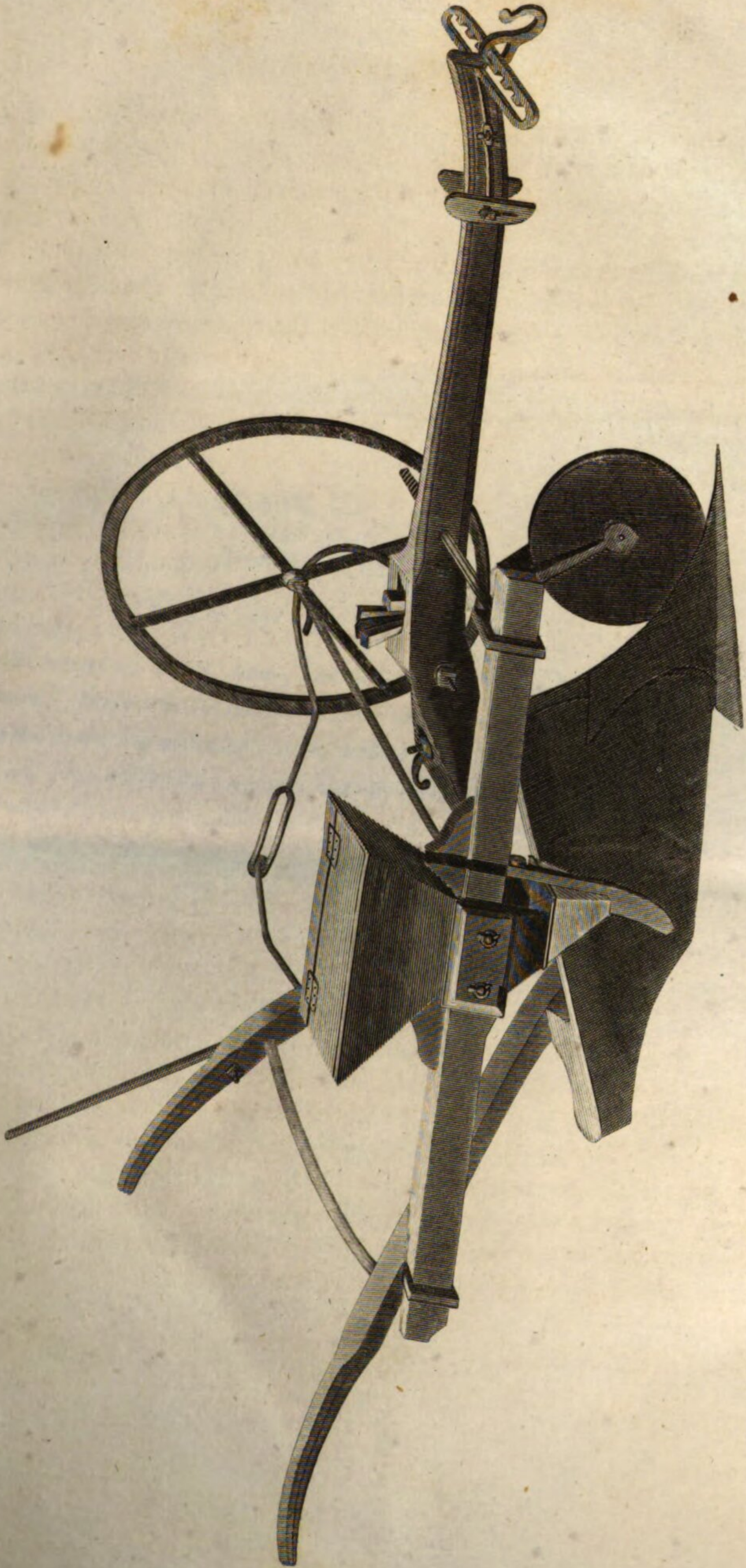
\* *Synopsis of Husbandry*, p. 110.

† *Young's Annals of Agriculture*, vol. VII. p. 204.



BEAN DRILL.

PL.  
Vol.









## PLATE II.

### *Bean Drill.*

[To face Page 594, Vol. II.]

THIS drill is the invention of Mr. Amos, and which Mr. Young has recommended as having much merit. It delivers the beans in a different manner from many others, as it scatters the seed on the slice of the preceding furrow, while they mostly drop it into the furrow. It has been extensively employed by the inventor; and on wet lands must be highly useful, by depositing the seed while the land is ploughing, and thereby preventing the necessity of going a second time upon it, which is often injurious.



PLATE II.

Bean Drill.

[To face Page 294, Vol. II.]

This drill is the invention of Mr. Ames, and which Mr. Young has recommended as having much merit. It delivers the beans in a direct manner from the hopper, as it scatters the seed on the side of the preceding furrow, while they mostly drop it into the furrow. It has been extensively employed by the inventor, and on wet lands must be highly useful, by depositing the seed while the land is ploughed, and thereby preserving the necessity of a second time upon it, which is often injurious.



stantly pass off from the portion of root above the seed to the upper part of the ground, large supplies of nourishment may be conveyed to the plants, which could not be the case when put in more superficially, as that part of the root below the seed is not furnished with such fibres\*.

The putting in of this kind of seed by the drill is a practice that may be performed with the most benefit and success on the drier and more mellow kinds of bean lands that have been some time in a state of cultivation; but on the wet and strong grounds it is frequently a difficult and troublesome process: it is therefore probably a better method to dibble them in upon the seed earth, especially in breaking them up from a ley, as where they have been previously ploughed, early tillage in the spring, however necessary, is impossible, it being only capable of being accomplished on a ley. In these cases a row may be put in by the dibble on every second furrow, by which they will be equidistant eighteen inches, or by dibbling two furrows together and missing one they will be in double rows at nine inches, with intervals of eighteen, which is equal to one row at every thirteen and a half inches†.

*After-culture.*—Where the broadcast method of putting in the crop prevails, little or no advantage can be afforded to it afterwards, which is a circumstance that renders that practice improper in most cases, as few crops derive more benefit from after-management than those of beans. In some instances, indeed, the large weeds are removed by a hoe or hook, and in others sheep have been turned in for the same purpose, as from their dislike to the bean plant they are said not to injure the crop either by eating the young plants or breaking them off‡. The practice is however too hazardous to be attempted except in particular cases. But where the crop is planted in rows, either by the drill, dibble, or other methods, the ground admits of being frequently stirred and laid to the roots of the plants by the hand or horse hoe, and of being kept perfectly clean by weeding; upon the proper performance of all which the perfection of the bean husbandry consists.

It has indeed been well observed by a correct and attentive cultivator, that these different operations are absolutely essential, and that where a wheat crop is to follow, the more money there is bestowed in this way, the better it is for the farmer; those of Kent being dissatisfied if it does not amount to from seventeen to twenty shillings the acre, as their wheat crop is sure to suffer where

\* Vancouver, in *Annals of Agriculture*, vol. XXV. p. 65.

† Young's *Corrected Report of Lincolnshire*.

‡ *Musæum Rusticum*, vol. III.; *Synopsis of Husbandry*; and *Modern Agriculture*.



there has been any neglect in these processes, beans well managed by the hoe being an excellent preparation for wheat crops \*.

In the methods of planting in rows, at the distances of fifteen or twenty-four, as well as on ridges at thirty inches, the horse-hoe may be most conveniently employed, but for narrower spaces the hand-hoe can only be made use of. The practice in Middlesex is, when the crops are about five or six inches high, to constantly hand-hoe the intervals, and clean the rows by weeding, and to repeat the same operations about the time of their coming into blossom, in which the earth should be carefully brought up to the roots of the plants, which has much effect, by the quantity of nourishment thus provided, in promoting the setting as well as filling of the pods. It has also been remarked, that, where the ground is in a situation to admit of the action of a small light plough, or a horse-hoe, to earth up the rows, great benefit may be thus produced, but that on the clayey loams this is only capable of being performed for a little time after they have been well moistened with rain †.

In the county of Kent it is frequently the custom to apply the roller and the harrow to the bean crops about the middle or latter end of March, by the first of which the cloddy parts are broken down and reduced, while the latter immediately following renders the baked surface-mold fine and powdery, by which means new supplies of nourishment are provided, and the advancement of the young plants greatly promoted. At no distant period after this the beans are edge-hoed, and then braked, the latter of which is a method of practice chiefly confined to that district, and which is considered by some cultivators as much preferable to the application of the hoe to the whole surface of the spaces between the rows, not only as being performed at a much less expence, but on account of its being more effectual in the removal of weeds, and providing more abundant supplies of such substances as contribute to the nutrition of plants, by loosening and newly aerating the surface-mold of the soil, as well as throwing it up to the roots of the beans. It is customary in many parts to repeat this process every fortnight or three weeks, from the early part of May till the season at which the crop blooms ‡. And it is observed, that the earthing up may be accomplished with facility by the above implement, merely by fixing a small piece of wood on the *strig* of it, the diameter of which regulates the height of earthing up the stems of the beans as they advance in growth §.

\* Young's Corrected Report of Lincolnshire.

† Annals of Agriculture, vol. IX.

‡ Corrected Report of Middlesex.

§ Synopsis of Husbandry.



In other bean districts, as in Berkshire, where they sow triple rows at eight or nine inches, and leave intervals of two furrows width, it is the practice to plough two furrows up each interval from the beans, making a ridge in the middle, by a small light plough contrived for the purpose, which is drawn by one horse, a moist season being chosen for the business. After this the ridges are to be harrowed by means of a triangular harrow, by which the superficial parts of the soil are rendered light and mellow, so as to admit the lateral fibres to shoot in it with facility, and draw forth support for the crop more effectually.

The manuring of the land is found from actual trials to be of very great advantage in the culture of this sort of crop; as even a very small portion of it, as from thirty to forty loads, of about eighteen bushels each, has been found of service both in promoting the crop and preventing the beans from becoming what is termed *rose-headed* \*. It has likewise been found, that by preparing the ridges in the manner that has been described above, and including manure in the middle of them, the seed may be put in much sooner than when they are flat and broad; and that by the use of the horse-hoe, the plants tiller more, the crops are forwarder, and subject to less injury from the attacks of insects †.

In some districts it is the practice to sow beans and peas together, or what is termed *blendings*; but this is mostly an improper method, as plants of different sorts never ripen well or equally together.

In such summers as are dry, beans are frequently liable to be much injured by the attacks of the black fly, or what is often termed the *dolphin*, the whole field in particular cases being in danger of being destroyed in the course of a few days. In order to prevent this mischief, it is the practice in some places to cut off the tops by means of a scythe or other sharp implement, as it is mostly on the tops of the plants that the insect first appears. When this method is adopted, it should be performed on the very first appearance of the fly, otherwise little benefit can be produced; as perhaps by removing the first insects that shew themselves, their propagation may in some degree be prevented.

The blight likewise sometimes proves destructive to the bean crops about June or July, when the weather is hot and foggy in the day with cold nights. In this case the blossoms fall off, and no pods are formed. But though much injury may often be done in this way, the crops sometimes turn out better than was expected; they should not therefore be given up too hastily.

The ripening of the beans is shewn by the *Pods* or *kids* turning of a black co-

\* Annals of Agriculture, vol. IX.

† Corrected Report of Middlesex.



lour, which mostly happens about the latter end of August, after which they begin to open at the ends; but they should always be cut or drawn up a week or ten days before this would happen, for though in some parts of the crop the kids may not be perfectly turned, this should not delay the business, as they will become ripe and hard after being cut or drawn up by the roots, by setting the sheaves upright, and leaving them exposed to the influence of the sun and air for seven or eight days. When cut or drawn up some time before they are in a suitable state of maturation, they shrink and become wrinkled; and if it be done when they are too ripe, they are liable to be lost by being shed in the field: it is a better practice, however, to reap them before they are fully ripe, than to let them stand until they are over-maturated. When they have become too much ripened, it is recommended to cut or draw them up while the dew is upon them, and to convey them in the same state to the stack. The parts of the crop that are not so perfectly ripened may be cut or pulled during the dry part of the day.

When the season is moist, and the land of a good quality, bean crops continue to proceed in their growth to a late period, and the pods formed on the upper parts of the stems remain green when those on the lower parts are in a perfectly ripe state. In such cases it is not necessary to delay the business of removing the crop, as by their remaining a little longer in the field no injury will be done either in the stack or to the sample. Indeed, as this sort of vegetable is extremely succulent, it is proper in most cases to let it remain out after being cut for a considerable length of time, in order that the excessive moisture may be fully dissipated, otherwise the sample may sustain great injury from moldiness, and taking on too great a heat in the stack. It may also on these accounts be necessary for them to remain in the stack for some time before they are threshed out.

There are different methods of removing this sort of crop from the land: in some districts it is the practice to reap or cut it close to the ground with a sharp hook contrived for the purpose; in others it is mown; and in a few it is pulled up by the roots, being afterwards bound up into pretty large sheaves by woollen yarn, old ropes, tarred cord or straw ropes, and set up three or four together.

In cases where wheat, tares, or other similar crops, are to be sown after beans, they should be set up in such a manner as to cover as little ground as possible, in order that the cleared ground may immediately undergo a suitable preparation for such succeeding crops.



The quantity of produce of beans is different according to the nature of the soil, the kind of seed, the method of planting, and the exactness with which the after-culture of the crop is conducted. In Middlesex it is stated to be from three and a half to four quarters the acre. And in Yorkshire, when cultivated as a preparation for wheat, from four to six quarters the acre; but where the crop precedes a fallow, only from two to three quarters. In other districts, as in Kent, where the bean husbandry is more perfect, the common tick beans are said to afford from two to six quarters, according to circumstances; the maza-gan, and other small beans of the same sort, from three to five quarters, and sometimes considerably more; and the Windsor, long-pod, and other large sorts of beans, from three or four to ten quarters the acre\*. Taking it throughout the whole kingdom, it is asserted by an able writer to vary from sixteen to forty bushels the acre, but that a good average crop can seldom be stated at more than twenty†.

The straw of this crop is useful for various purposes. When well broken by threshing, it forms a durable litter for working horses, as well as hogs and other animals. It is also asserted to be a hearty and nutritious food for cattle during the winter season; and that both oxen and horses, when not wrought, thrive well upon it. And as the reduced parts, or what is termed the *caving-chaff*, have been found valuable as a manger food for the labouring teams when blended with other substances, it is probable that in particular cases the stems might be cut into chaff with advantage. But when made use of in these methods, it should be taken as fresh as possible from the flail.

The smaller kinds of beans are principally employed in the feeding of horses, hogs, and other animals; and as they contain a third more meal in a given portion than oats, and at the same time probably afford a more durable nourishment, it must be economical to make use of them in the feeding of labouring horses. And on the same principles they must be advantageous when used in the fattening of cattle, &c. But when hogs are fed with this sort of food, it is asserted that the pork is indifferent from the meat becoming hard, though for bacon it is extremely good.

Where the beans are to prepare the land for wheat, it is essentially necessary that the stubble, with such weeds as may have been left, should be removed as expeditiously as possible after the beans are taken off. This purpose is well

\* Corrected Reports of Middlesex, North Riding Yorkshire, and Kent.

† Donaldson's Modern Agriculture, vol. II.



accomplished in some bean districts, and at the same time a great degree of pulverisation effected, by *spuddling* the land with a kind of plough, to the share of which an iron plate is attached crossways, at the distance of about four or five inches from the point, the same axle-tree and wheels being employed as were used in striking the furrows. By this implement, with two horses and a man, it is asserted three acres of land may be finished in a day, by setting the point of the share in the intervals in such a manner as that the plate or fin may extend to a row on each side. After this operation has been performed, by passing the harrows and the roller over the land, the whole is cleared with little expence, and left ready for the seed earth\*. On the more thin and light kinds of soils, whether of the chalky or gravelly sort, such a process may, however, be improper, as such lands may be rendered too open and porous for wheat crops by it.

*Potatoes.*—The cultivation of this highly valuable vegetable has rapidly increased within these last twenty years, so that it may now be considered as standing next to wheat in respect to human food.

Though the varieties of this plant that are cultivated are extremely numerous on account of their being raised continually from seed, there does not appear to be more than two distinct species; the *red-rooted*, or that which bears a purple blossom or flower, and the *white-rooted*, or that which has a white flower.

It is suggested by an intelligent practical writer, that much still remains to be performed in respect to the improvement of the quality and productiveness of this plant, by raising it from seed. The farmers in Yorkshire, it is observed, adopt this method. “In autumn when the apples are beginning to fall spontaneously, they are gathered by hand, and preserved among sand until the spring, when they are mashed among the sand, or among fresh mold, separating the seeds, and mixing them evenly with the mold. So soon as the spring frosts are judged to be over, they are sown in fine garden mold; and as fast as the plants get into rough leaf, and are strong enough to be handled without injury, they are transplanted into another bed of fresh mold in rows, which are kept clean during summer. In autumn, bunches of small potatoes are found at the roots of these plants, varying in size, the first year from an hazel nut to that of a crab apple. These being planted in the succeeding spring, produce potatoes of the middle size; but they do not arrive at their full bulk until the third or fourth year. When the use of the stove or the garden frame can be procured, this process may be shortened; the seeds being sown within these early in the spring,

\* Synopsis of Husbandry.



the plants will be fit to be planted out as soon as the frosts are gone, by which means the size of the roots will be much increased the first year, and will, in the second year, rise nearly to perfection\*." It is also added, that, in selecting proper plants from seedling potatoes, two circumstances are necessary to be attended to; which are, the quality of the potatoe, and its productiveness. In cases where these different properties are combined in the same plant, there can be no difficulty in deciding in its favour.

The varieties of this root, that are at present in cultivation in different parts of the kingdom, are extremely numerous. In Lancashire, where the potatoe husbandry is well understood and largely practised, there are, according to the account of Mr. Kirkpatrick, upwards of twenty sorts of the more early kinds, and more than half as many of those of the late†.

The *old winter red* is an excellent variety for the table in the spring, when most other sorts have lost their flavour, and are become unfit for use by sprouting. It is said likewise to have the property of not being liable to the curl.

The *blacks* are likewise a late sort, which keep well till about August.

\* Donaldson's Modern Agriculture, vol. II.

† These different varieties are thus denominated in his tract on the culture of the potatoe.

*Early kinds.*

Smooth yellows,  
Red champions,  
White ditto,  
Lady queens,  
Drunken landlord,  
Birchal's golden yellows,  
Smith's seedlings,  
Foxe's ditto,  
Boskew's kidneys,  
English champions,  
Britton's dwarfs,  
Bates's ditto,

Mather's seedlings,  
Kerkham marbles,  
Donbodin's seedlings,  
Poor man's profit,  
Golden gulleons,  
Invincible,  
Broughton's dwarfs,  
Hatley's nonesuch,  
Early perrins,  
Forcing dwarfs,  
Early Manleys.

*Late kinds.*

American white rangers,  
Ditto red ditto,  
Derbyshire reds,  
Late champions,  
Ditto kidneys,  
Pink eyes,  
Pink-nosed kidneys,

Ox noble,  
Lords,  
Seedling varieties,  
Balmer's seedlings,  
Budworth's dusters,  
Irish apples,  
Winter kidneys.



As cattle potatoes, the *ox noble* and the *cluster* are the varieties principally cultivated, as they are both large in size and very productive.

The *white* and *apple* sorts are however most proper for being made use of in the early part of the season. And the *pink-eyes* and *copper-plates* are of a hardy nature, and probably capable of being grown with less perfect culture than most of the other varieties. But though a number of trials have been made in order to determine the differences in the productiveness of the different varieties, yet from the effects which the differences of soil, climate, culture, and other causes produce, the matter has not been decided with much correctness\*. The *royal* or *Cumberland early* is very productive and of a large size, with a good flavour, and besides, it ripens early.

The soil in which this root is capable of being produced to the greatest advantage is a rich loam of the light sandy kind, that possesses a medium degree of moisture. They may, however, be grown with success on lands that are

\* The products in the experiments of Mr. Young, with the three following sorts, under the same management, in the drill method, were these:

| Kinds.                     | Produce.     |
|----------------------------|--------------|
| Cluster . . . . .          | 360 bushels. |
| Red-nosed kidney . . . . . | 144          |
| Golden tags . . . . .      | 207          |

And the results of Mr. Baker's trials in Ireland, in comparing different sorts, are thus stated:

| Sorts.                  | Produce.     |
|-------------------------|--------------|
| Commonwise . . . . .    | 21 lb. 6 oz. |
| Apple . . . . .         | 20 2         |
| Red French . . . . .    | 15 12        |
| Munster white . . . . . | 16 0         |
| Crones . . . . .        | 16 6         |
| Spanish . . . . .       | 15 10        |

On repeating the experiment, the result was:

| Sorts.                  | Produce.              |
|-------------------------|-----------------------|
| Black . . . . .         | 111 barrels per acre. |
| Quakerwise . . . . .    | 108                   |
| Red French . . . . .    | 88                    |
| White ditto . . . . .   | 85                    |
| Commonwise . . . . .    | 103                   |
| Apple . . . . .         | 76                    |
| English white . . . . . | 83                    |
| White Munster . . . . . | 79                    |
| Spanish . . . . .       | 70                    |
| Crones . . . . .        | 60                    |



much stronger, where proper attention is bestowed in their culture. On grounds of the peat-moss kind they have likewise been found to succeed in a high degree. In Mr. Townley's experiments, though the more stiff and tenacious sorts of lands do not seem to have been tried, the produce appears to have been the largest on the strong kinds of soil; but, in every case, it is essential that they be dry, the stagnation of moisture being highly detrimental to the growth of this root\*.

The potatoe, though it is found to succeed to advantage in the more open and porous sorts of land, is not well suited to those of the perfectly sandy kinds, as they seldom retain a sufficient degree of moisture to enable the tuberos roots of the plants to swell out and become of a good size, nor is there, in general, a sufficient proportion of vegetable mold in such soils to promote the most perfect growth of the crop. It is only in such as possess a considerable degree of lightness and good carbonic earthy matter, that they are enabled to propagate their subterraneous wires or root-buds, become fully distended, and attain their utmost size and increase.

This is fully shewn by the experiments of Mr. Somerville, in cultivating potatoes with good earth alone instead of manure; as, where that was employed, the produce was much more abundant than in other cases†.

In order that this state or condition of the ground may prevail in as high a degree as the nature of the land will admit, it may be the most advantageous practice in the field culture of this plant to put in crops of this kind in the more heavy adhesive soils, after bean, cabbage, or other vegetables of the same nature, that require manure; and in those of the more light descriptions, after peas, such grain crops as demand a fineness of tilth, and on such lands as are under the state of fallow.

It is a practice in some districts to raise potatoes on the *ley* grounds when first broken up; but this can seldom be an advantageous method, except where they are planted in what is termed the *lazy bed* manner, or by the dibble in the middle of the furrow slice, in which, from the large quantity of loose mold by which the sets are covered, good crops may be produced, as is often the case

\* The results on planting four eyes of the cluster potatoe, on four different sorts of soil, were these:

| Kind of Soil.         | Produce. |
|-----------------------|----------|
| On a strong rich loam | 34 lb.   |
| On a light rich loam  | 29       |
| On a good gravel      | 19       |
| On a sand             | 15       |

† Report of the Board of Agriculture.



in Lancashire, where this mode of planting was formerly much in use. It has likewise been suggested, that potatoes may be grown in a very beneficial manner on sward lands, by ploughing them very thin, and putting the sets in under furrow \*. And in these cases Mr. Somerville advises, that a plough be made use of that only just pares off the sward, and deposits it flat in the bottom of the furrow, the root side uppermost; the sets being placed by the planter on the inverted sod immediately after this plough, and then covered with the fine mold from below by a common plough.

But whatever may be the nature of the soil on which the potatoe is planted, it should be reduced by the operation of the plough, spade, or harrow, into as fine and mellow a condition as possible, in order that the earth may lie so light and porous as to admit of the proper swelling of its knobby roots. In most districts where this root is much cultivated it is the custom to give the land that is intended for this crop one or two ploughings in the latter part of the autumn, and, after it has been thus exposed to the influence of the atmosphere during the winter, in the spring at the time of planting to reduce the cloddy surface well by means of harrowing, after which the ground will be in a suitable condition for receiving the sets. On the marsh lands in the West Riding of Yorkshire, where the cultivation of the potatoe in the field is carried on to a considerable extent, the lands that are intended to be cropped with this root, whether the preceding crops have been wheat, beans, or oats, are ploughed up at Christmas, or as soon after as the work can be done; and in the middle of April, if the soil has become sufficiently dry, it is harrowed well at intervals, occasionally using the roller, until the whole has been brought into a perfectly fine state. After this the land is to be ridged up, in order to be planted.

As the potatoe forms its produce below the ground, and is of very luxuriant growth as well as considerable increase, it can but in few cases be cultivated to advantage without the assistance of manure. And as it requires that the soil should be kept free from the stagnation of moisture, as well as light and open, it may be the most advantageous method to make use of the stable kind in its long or more littery condition, as by this means the ground, especially when of the wet kind, may be kept more light and open, as well as more free from injurious moisture, and at the same time a more durable supply of nourishment be provided for the crop, by its more gradual decay. Where this sort of manure cannot be provided in sufficient quantity, old thatch, the strawy litter from the fold-yard, or any similar material, may be employed.

\* Experienced Farmer, vol. I.



But in the light sorts of soil, dung in its more putrid reduced condition may be made use of with much propriety, as in such cases the mold is mostly in a sufficiently porous and open state, and they have rarely too much moisture remaining upon them. A great variety of different sorts of manure have been tried by experimenters in the culture of the potatoe; but those which have been just described seem to be the best adapted to the crop\*. Mr. Billingsly, how-

\* The following comparative statement of the effects of different kinds of manure in the culture of this valuable root, has been given in a very able Report on the Cultivation of the Potatoe, drawn up by a committee of the Board of Agriculture.

|                     | Manure per Acre.                                               | Crop: Bushels. |
|---------------------|----------------------------------------------------------------|----------------|
| EXPERIMENT, No. I.  | 53 Loads (cubical yards) farm-yard dung . . . . .              | 400            |
|                     | 160 Bushels, foot . . . . .                                    | 360            |
|                     | 160 Ditto, wood-ashes . . . . .                                | 240            |
|                     | 32 Loads of dung . . . . .                                     | 280            |
|                     | 42 Ditto . . . . .                                             | 360            |
|                     | No manure . . . . .                                            | 180            |
| EXPERIMENT, No. II. | 32 Loads of dung, and 40 bushels of wood-ashes . . . . .       | 400            |
|                     | No manure . . . . .                                            | 280            |
|                     | 160 Bushels of flaked lime . . . . .                           | 380            |
|                     | 1½ Ton of barley straw . . . . .                               | 300            |
|                     | 340 Bushels of pot-ash . . . . .                               | 380            |
|                     | 32 Loads of dung . . . . .                                     | 400            |
|                     | 32 Ditto, and 160lb. salt added at time of spreading . . . . . | 400            |
|                     | 32 Ditto, and 160 bushels lime . . . . .                       | 480            |
|                     | 32 Ditto, and 480 gallons urine . . . . .                      | 520            |

In Mr. Young's trials, the results were these:

|                                                | First Year.                    | Second Year. |
|------------------------------------------------|--------------------------------|--------------|
| No. 1. No manure, . . . . .                    | produced 120 bushels per acre, | 140          |
| 2. Night-soil, 10 waggon loads . . . . .       | 600                            | 640          |
| 3. Ditto, 6 ditto . . . . .                    | 650                            | 500          |
| 4. Ditto, 2 ditto . . . . .                    | 500                            | 300          |
| 5. Bones, 10 ditto . . . . .                   | 650                            | 640          |
| 6. Ditto, 6 ditto . . . . .                    | 640                            | 560          |
| 7. Ditto, 2 ditto . . . . .                    | 560                            | 240          |
| 8. Hog dung, 60 one-horse cart loads . . . . . | 480                            | 300          |
| 9. Ditto, 30 ditto . . . . .                   | 480                            | 160          |
| 10. Yards compost 60 ditto . . . . .           | 300                            | 240          |
| 11. Ditto, 120 ditto . . . . .                 | 480                            | 300          |
| 12. Ditto 30 ditto . . . . .                   | 140                            | 140          |

In



ever, seems to recommend *well-rotted* horse-dung, though the long dung is noticed as being the next in value\*. The nature of the soil in which this was the case is not distinctly mentioned; it was probably of the sandy kind, in which there can be little doubt but that horse-dung, in a highly reduced state, would be of the most benefit, as a larger proportion of carbonaceous earthy matter would thereby be immediately provided for the growth of the crop, and the ground be more preserved from becoming too dry, light, or porous.

The dung of hogs has also been found, by the experiments of the same cultivators, to be nearly equal to that of the horse, in raising crops of this highly valuable root.

When this sort of crop is cultivated on the stiff and more heavy descriptions

In Lancashire, Mr. Townley, on comparing different descriptions of manures, found that

| Manures. |                                                  | Produce.                       |
|----------|--------------------------------------------------|--------------------------------|
| No. 1.   | Coal ashes only,                                 | produced 211lb., rather small. |
| 2.       | Stable dung and coal ashes mixed                 | 344, very fine.                |
| 3.       | Stable dung alone                                | 315, ditto.                    |
| 4.       | No manure                                        | 134, very small.               |
| 5.       | Compost, dung lime, and soil                     | 204, middling.                 |
| 6.       | Stable dung covered with common yellow mafs      | 438, remarkably fine.          |
| 7.       | Soaper's waste                                   | 383, very fine.                |
| 8.       | Stable dung and lime                             | 268, tolerable.                |
| 9.       | Lime alone                                       | 187, ditto.                    |
| 10.      | Coal ashes and lime                              | 19, ditto.                     |
| 11.      | Stable dung and soaper's waste                   | 298, very good.                |
| 12.      | Soot, foil, and coal allies                      | 271, ditto.                    |
| 13.      | Salt and foil                                    | 200, ditto.                    |
| 14.      | Saw-duft and coal ashes                          | 190, smaller.                  |
| 15.      | Stable dung and saw-duft                         | 307, very fine.                |
| 16.      | Dung of poultry and coal ashes                   | 236, pretty fine.              |
| 17.      | Dung of poultry and sand                         | 156, rather small.             |
| 18.      | Saw-duft and lime                                | 197, ditto.                    |
| 19.      | Decayed rushes and lime                          | 208, very good.                |
| 20.      | Tanner's bark and lime                           | 76, very poor.                 |
| 21.      | Bark and stable dung                             | 141, rather larger.            |
| 22.      | Bark alone                                       | 35, very poor.                 |
| 23.      | Stable dung and lime spread over the land        | 230, pretty fine.              |
| 24.      | Chopped whins, with a covering of lime over them | 256, very fine.                |

In these trials the manure was placed in furrows of five-feet lands.

\* Billingsly's Report of Somersetshire; and Wimpey, in Bath Papers, vol. VI.



of loamy soils, on the principle of keeping the earth light and open by their very gradual decay, in order that the roots may have room to extend themselves, many other substances besides littery dung have been employed. Wheat straw, furz, broom, heath, and other similar matters, after having been in some measure reduced by chopping, are deposited in the drills, and, from their gradual decay, good crops are frequently produced.

Clover, tares, vetches, and other succulent vegetable productions, when enclosed in the soil in their green state, at the time of planting, have also been found useful as manure in the growing of crops of this kind \*.

Peaty or turfy materials have likewise been made use of for the same purpose on different sorts of land. On the light, thin, and open soils, they are asserted to have good effects, in contributing to the nourishment and support of the crop, in rendering them more capable of retaining moisture, and by increasing their staple. And in the heavier soils they become of much use, by keeping them in a more open condition, and thereby allowing the moisture to pass off more readily, and the roots of the plants to swell out in a proper manner. It is probable likewise that fresh vegetable earth, and decayed leaves collected from woods or other places, may be of service in this way, as well as in the manner that has been mentioned above.

The trials that have been made with lime render it probable that it may be usefully employed in the cultivation of the potatoe on the stiffer sorts of soils, when combined in a small proportion with rich earth and dung; but, in its simple state, according to the experiments of Mr. Somerville, it has a tendency to induce the *curl*; and in the garden culture of this root, we have constantly found it disadvantageous by producing the *canker*, whether employed in the *effete* or state of *carbonat*, or in its more active or *caustic* one.

But though lime in its uncombined state may not be capable of being made use of with much utility; where the practice of paring and burning is had recourse to, and there is a considerable portion of ashes from the combustion of the sward and the coarse vegetable products upon it, full crops of potatoes may be raised by the use of the ashes alone. In this way, the coarse unproductive pasture grounds in various parts of the kingdom, and extensive tracts of useless waste lands, may be brought into a state of cultivation in an easy and profitable manner; as after a crop of potatoes, put in in this method, the land will, in most instances, be in a proper condition for the growing of grain crops.

\* Billingsly, in Bath Papers, vol. VI.



On the sea coasts, in the northern parts of the island, sea-weed is said to have been found useful in the growth of the potatoe\*.

Whatever sort of manure may be made use of in the growth of potatoes, it is necessary that the quantity be fully sufficient for the purpose of providing not only a suitable bed for the establishment of the roots of the plants, but also for affording a due supply of nourishment during the whole time of their growth, as upon these circumstances the success of the crop seems in a great measure to depend.

After a very full and extensive experience in the cultivation of this vegetable, an able and intelligent agricultor advises, that not less than twenty cart-loads, of thirty bushels each, should be applied, as the richer the ground the more abundant the crop; and that, however strong the soil may be, the farmer should not depend upon it to the exclusion of manure†.

Where the sets are put in in the drill method, the manure should be deposited as evenly as possible at the bottoms of them; and in the other modes it must constantly be spread out in a regular manner, in order that the crops may be brought forward with as much uniformity as possible. In raising crops of the early kinds of potatoes, it may be a more advantageous practice to apply the manure for the previous crop; as where the contrary is the case, the haulm or stems of the plants are apt to become too luxuriant, and thereby prevent the roots from acquiring a proper size. Besides, it is probable that the flavour of the potatoe may be better, and the substance less watery.

*Time of planting.*—The putting of this sort of crop into the ground should always be performed in the early spring months, as soon as possible after the danger of frost is over, which, in the more southern districts, is generally from about the middle of March till the latter end of April; and, in the northern ones, it is mostly from about the middle of April until towards the close of May, according to the differences in the state of the climate. The earlier the crop can be got into the ground, the better it becomes, as the potatoes are said to turn out more mealy, and of a finer flavour. Besides, they have a better chance of being taken up and removed from the land, while the season is dry; and there is less risk of injury from moisture and frosts after they are fit for taking up. It may also be added, that the land will derive much advantage from being ploughed up while it is in a dry condition, after the potatoes have been removed, as in this way it is preserved in a less moist state during the win-

\* English Encyclopædia, art. Husbandry; and Bath Papers. † Billingsly, in Bath Papers, vol. VI.



ter, and the weeds are more effectually destroyed \*. But at whatever period the crop may be put into the ground, the business should be performed as much as possible when the weather is dry, and the land not too much soaked with moisture, as under such circumstances the early vegetation of the crop always proceeds in a more regular and expeditious manner, by which the produce is generally rendered better in quality and more abundant.

*Seed.*—In the choice of potatoe seed for the purpose of planting, it is necessary to attend to the differences in the varieties, in respect to forwardness, their qualities as food for man or animals, and the variation in their productiveness; as upon the properly adapting these to the nature of the soil and climate, as well as the views of the cultivator, much advantage may probably be obtained in the culture of the crop. It is generally recommended, that the sets should be taken from such potatoes as are the finest and most perfect of their kinds, as by such means better crops may be produced, at the same time that there will be less risk of their being attacked by disease. And it is contended by some, that, from the eyes being stronger in such large-sized potatoes, stronger and more vigorous plants are produced, and of course a larger produce afforded. The difference between the use of large and small potatoes, for the purpose of seed, being in the proportion of thirty sacks to the acre in favour of the former †. It may also be of great advantage in the culture of this root, to take the seed or sets from such varieties as have not been too long cultivated, as it has been found, that the continuing the cultivation of the same sorts for some length of time has a tendency not only to injure the quality, but lessen the quantity of the produce ‡. It has likewise been suggested, that the potatoes intended for seed should be raised without manure in such soils as are of the fertile kind; and on those that are of a poor quality, by a less proportion than is usually the case, and without so much earthing up in the after-culture of the crop, as, by such means, it is supposed there may be less danger of the crops becoming affected by disease ||. In the same intention, it has been recommended by different cultivators to change the seed every two years, carefully collecting such as is brought from a considerable distance. It would seem probable, however, that, in guarding against accidents of this kind, much depends upon the ground being well prepared for the reception of the crop, and on the after-culture being perfectly performed.

\* Campbell, in Bath Papers, vol. IX.

† Experienced Farmer, vol. I.

‡ Bath Papers, vol. IX.

|| Corrected Report of Middlesex, and Transactions of the Society of Arts, &c.



In respect to the seed or sets, different modes have been advised by different cultivators, some preferring whole potatoes, or large cuttings, while others think small cuttings, sprouts, or even the eyes, the most beneficial. All these different sorts of sets are, indeed, found in practice to produce good crops; though it seems probable, from the various experiments that have been made upon the subject, that the middle-sized whole potatoes, and the large cuttings of large ones, are in general more productive than either the smaller sort of whole potatoes, small cuttings, or the eyes or shoots alone\*.

If, indeed, the expence in seed, where whole potatoes are made use of, be taken into the account, it is probable that the large cuttings of middling-sized

\* The results of the experiments made by the Rev. Mr. Campbell, as stated in the Bath Papers, in order to ascertain the superiority of the different kinds of sets, and the most proper distance of planting in respect to the rows, are these:

|                      | Rows.                                            | Inches distant<br>in rows. | Value of produce per<br>acre, seed deducted. |
|----------------------|--------------------------------------------------|----------------------------|----------------------------------------------|
|                      |                                                  |                            | £. s. d.                                     |
| EXPERIMENTS IN 1790. | 1. Small whole potatoes                          | 6                          | 16 6 7 $\frac{7}{8}$                         |
|                      | 2. Large pieces                                  | 3                          | 15 16 6                                      |
|                      | 3. Large pieces                                  | 6                          | 15 8 6                                       |
|                      | 4. Large pieces                                  | 12                         | 13 4 1 $\frac{7}{8}$                         |
| EXPERIMENTS IN 1791. | 1. Large whole                                   | 6                          | 18 18 1 $\frac{1}{2}$                        |
|                      | 2. Small whole                                   | 3                          | 18 1 4 $\frac{1}{2}$                         |
|                      | 3. Small whole                                   | 6                          | 17 11 9 $\frac{1}{2}$                        |
|                      | 4. Small whole                                   | 12                         | 17 3 6                                       |
|                      | 5. Small pieces                                  | 6                          | 16 1 5 $\frac{1}{4}$                         |
| EXPERIMENTS IN 1792. | 1. Small whole                                   | 6                          | 19 7 1 $\frac{1}{4}$                         |
|                      | 2. Large whole                                   | 6                          | 18 18 1 $\frac{1}{2}$                        |
|                      | 3. Large whole                                   | 12                         | 18 9 9 $\frac{1}{2}$                         |
|                      | 4. Large pieces                                  | 6                          | 18 3 0                                       |
|                      | 5. Small whole                                   | 12                         | 18 1 3 $\frac{1}{4}$                         |
|                      | 6. Large pieces                                  | 12                         | 16 19 6                                      |
| EXPERIMENTS IN 1794. | 1. Middle-sized whole                            | 12                         | 32 8 0 $\frac{5}{12}$                        |
|                      | 2. Middle-sized, confined to one eye<br>and stem | 12                         | 23 12 1 $\frac{1}{12}$                       |
|                      | 3. Middle-sized whole                            | 6                          | 25 7 3 $\frac{1}{12}$                        |
|                      | 4. Small pieces                                  | 12                         | 29 19 2 $\frac{3}{12}$                       |
|                      | 5. Small pieces                                  | 6                          | 28 17 6 $\frac{1}{12}$                       |
|                      | 6. Small whole                                   | 12                         | 29 2 4 $\frac{1}{12}$                        |
|                      | 7. Small whole                                   | 6                          | 26 19 3 $\frac{7}{12}$                       |
| EXPERIMENTS.         |                                                  |                            |                                              |



potatoes, where only one or two eyes are preserved, may be the most proper and successful in producing crops; as where whole potatoes are employed, from the great number of eyes, and the consequent production of numerous stems, the crops may be liable to be too thick or close on the ground, and in that way be rendered weak, and the produce of course small and deficient, the bulbs not being able to swell out and distend themselves sufficiently.

It is remarked by the ingenious experimenter mentioned above, that “the greater the number of strong fibres and roots, the more they search for food, and the more earth they displace in the course of their growing, which divides the soil more minutely and gives it the advantage of better pulverisation; and the greater abundance there is of leaf, the more nourishment is extracted from the air, and which are thus made to co-operate more with the vegetable pasture in the soil in bringing the plants to perfection; and the thick foliage of the crop, by its umbrageous shade, has the same ameliorating qualities with a heavy crop of peas, or beans, in destroying weeds, retaining the dews, and preventing the draught from penetrating and exhausting the soil.”

He adds, however, that “it is to be observed, that too many as well as too few stems are unfavourable to the prevalence of fibres, and to the luxuriance of the leaves.” It is therefore concluded, that perhaps pieces about two ounces in weight are the most proper for being planted, and whole potatoes from that weight to one ounce; these, says he, may be called large pieces and small potatoes; and from them, it is probable, there will issue a sufficient number of stems to produce as many roots as the immediately surrounding earth can bring to perfection. To produce more, he thinks, would make the roots small; to produce fewer, would give a less quantity of root from the acre.

On these accounts, therefore, as well as from large whole potatoes, and large cuttings, consuming so much seed, it is evident that they can seldom be

EXPERIMENTS IN 1795, without dung, after dunged potatoes.

| Rows.                           | Inches distant<br>in rows. | Value of produce per<br>acre, seed deducted. |
|---------------------------------|----------------------------|----------------------------------------------|
|                                 |                            | £. s. d.                                     |
| 1. Shoots . . . . .             | 12 .                       | 15 11 9 <sup>6</sup> / <sub>11</sub>         |
| 2. Large pieces . . . . .       | 12 .                       | 26 1 10 <sup>1</sup> / <sub>12</sub>         |
| 3. Large whole . . . . .        | 12 .                       | 23 10 8 <sup>10</sup> / <sub>12</sub>        |
| 4. Small whole . . . . .        | 12 .                       | 24 2 11 <sup>1</sup> / <sub>12</sub>         |
| 5. Middle-sized whole . . . . . | 12 .                       | 24 2 11 <sup>1</sup> / <sub>12</sub>         |
| 6. Middle-sized whole . . . . . | 9 .                        | 23 19 5 <sup>1</sup> / <sub>12</sub>         |
| 7. Middle-sized whole . . . . . | 6 .                        | 28 11 7 <sup>7</sup> / <sub>12</sub>         |



employed with advantage, especially as the result of experiment has shewn that such whole potatoes as are moderate in size, and such cuttings as are not too large, are generally capable of producing the best and most abundant crops \*.

It is necessary, however, where cuttings are made use of, to take care that they contain a sufficient proportion of matter about the eyes or *root-buds*, to afford nourishment and support to the plant during the process of germination, and until it be perfectly established in the soil.

On the principle of saving seed in scarce and dear seasons, it has been advised by some to have recourse to the shoots †, and, by others ‡, to the eyes only; but the use of these, except under such circumstances, is liable to many objections. Where the shoots are employed, the crops are found to be considerably more backward in becoming ripe, consequently more exposed to the danger of cold winds and frosts about the period of their being taken up; besides, from their being more tender than sets taken from the cuttings of potatoes, they cannot be put into the ground at so early a period. But the most material objection is, in many of the plants being so weak and imperfect in their growth, as to afford little or no produce. Where the plough is made use of in planting them, there may likewise be danger of their being injured by the trampling of the horses, except great care be taken to prevent it.

Where the eye or *root-bud* of the potatoe is employed as seed, it is usually cut out of it by a scoop or implement contrived for the purpose, to the thickness of about half a crown. But though this mode of sets is said to have been made use of with success by some cultivators, it is probably liable to most of the inconveniences that attend the setting of shoots.

Good crops are, however, asserted to have been obtained in this way by different cultivators, in particular descriptions of soil; but others of equal credit assure us, that it is but in very few instances, as where the soil is peculiarly adapted to potatoe crops, that sets of this kind succeed in any tolerable manner. It was found by an intelligent agricultor, in making an experiment with scooped sets, and such as were prepared by cutting with a knife, in the ordinary way, from potatoes of the same kind, that on nine of the best-looking sets of each kind being planted on the same land, in alternate drills, the cuttings came up and proceeded in their growth without sustaining the least injury; while the scooped sets, though they grew, continued in a perfectly dwarfish state when

\* Bath Papers, vol. IX.

† Maunfell, in Transactions of Dublin Society, vol. II. 1799.

‡ Stewart, in Ibid.



compared with them. And on being taken up and preserved in separate baskets for about a month, and then weighed, the produce of the former afforded by much the greatest weight; the cut sets giving one stone and half a tron, while the scooped ones yielded only three quarters of a stone, the small fractions not being noticed. And in another trial, where one peck was cut with the knife, and the same quantity prepared by the scoop, and set in the same field, there was no perceptible difference in the growth of the crops while upon the ground; but, on taking them up, the difference of the produce in measure was a peck and a half in favour of the cut sets\*.

It was, however, found on planting cut and differently scooped sets alternately, on a light earthy soil, in the drill manner, at the distance of twenty-four inches between the rows, the scooped sets being prepared to three-fourths and seven-eighths of an inch, and the after-culture performed in the same way in each; that on taking up the different drills, and measuring them separately, the quantity of produce was nearly equal in every case. Hence it is concluded, that "scooped seed, and even the smallest of the scooped seed, produce equal to large ones, or those cut in the ordinary way†." Similar success seems likewise to have attended the planting of scooped seed under the direction of Mr. Ford, in Suffolk‡. However, though such sort of sets may occasionally, under favourable circumstances of soil and situation, afford full crops, it is probably a method of practice that should seldom be had recourse to but in cases where there is a difficulty of procuring a proper supply of other kinds of seed.

On the whole, though there is reason to suppose, from the various experiments that have been made on the nature of the seed, or sets of potatoes, that the quantity of produce is not, as has been supposed, exactly in proportion to the weight of them, yet that it is in some measure influenced by that circumstance, and their having a suitable number of *root-buds*, as well as a due proportion of pulpy material surrounding them, to ensure the perfect evolution and support of the plants in the early stages of their growth, and until they become completely established in the ground.

*Methods of Planting.*—In the putting of potatoe crops into the ground, different modes are adopted in different circumstances of soil and situation. On all the more dry and sandy descriptions of land, the surface of the ground should not be raised, but kept as much as possible on the flat; but where the climate is

\* Farmer's Magazine, vol. III. p. 103.

† Ibid.

‡ Commercial and Agricultural Magazine, vol. III.



damp, and there is more moisture in the soils, and less danger of their becoming too dry for the perfect growth of the potatoe, and on all the thinner sorts of soils, it may be the most advisable method to raise the land into what is termed one-bout ridges; as, in this way, the depth of the staple is considerably augmented, the manure is more concentrated for the support of the crop, a better bed is provided for the fibrous roots and wires of the plants to establish and extend themselves in, the danger of stagnant moisture guarded against, and the after-culture of the crops rendered more easy, beneficial, and convenient, by which they may be kept more clean and free from weeds, and be earthed up at different times, so as to insure the most full and perfect extension of the roots in the fine mold that is thus constantly laid up. And as the whole of the process is capable of being performed by means of the common plough and a horse or two, it is probably the most advantageous where such crops are cultivated on land that has been some time in the state of tillage. Where the ridges are only required to be small, the operation is completed in one bout of the plough, or by going up with one furrow and laying another up to it in returning, so as to produce a ridge in the middle. This is the method that is the most commonly pursued in those districts that are the most engaged in the cultivation of this valuable root.

It is the custom in the Lancashire practice of planting, after the land has been harrowed fine and level on the surface, to make equidistant drills the length of the field, in doing which, the plough, after making a furrow up the field, must be drawn down again on the contrary side close by the same, throwing the soil equal heights on each side. These drills are made as wide and deep as will make them capable of containing the dung, which is to be laid in the bottom of each. The distance of the drills is such, that when the horses stand in one, each wheel of the cart or tumbrill may be in the middle of the next drills on each side. The next operation is to carry in the manure; and as the horses stand in one drill, and each wheel of the cart in a similar situation, the neatness and order of the land is very little injured. The dung is then to be thrown out of the cart in small heaps, sufficient to supply the three drills which the horses and the wheels of the cart occupy, a moderate scattering of which is to be put into the bottom of each. This will be completed in a very short time by persons with forks of two tines.

Where long strawy dung, lately thrown out of the stables or cow-houses, or collected from the farm-yard, can be procured, it is employed. When the drills are thus prepared, the sets are put into them upon the dung about six inches



distant from each other. The plough is then to be run on both sides of each drill, to throw the earth which was raised out of it upon the potatoes. This operation will elevate it in the middle, and cause it to lie sloping on each side like the roof of a house. The business is thus complete until the stems of the potatoes begin to make their appearance above ground.

But in the West Riding of Yorkshire, where the culture of the potatoe is well performed, according to the Report of that district, after the land has been properly prepared, the best cultivators begin to ridge it up by ploughing a furrow round it down, and then taking a suitable distance according to the nature and qualities of the soils, as from about two feet eight inches to three feet, such as are rich and fertile requiring more space of ridge than such as are poor and exhausted. The manure, where necessary, is disposed with regularity in rows by means of a labourer with a fork, in the ridges, the potatoe sets being then placed at suitable distances upon it, and covered by the plough.

The method recommended by other cultivators in the northern parts of the island, after much experience, is, after the ground has undergone a thorough preparation, and is made perfectly level by repeated ploughing and harrowing in different directions, to draw straight parallel furrows by means of a double earth-boarded plough, drawn by a single horse, at the distance of two feet and an half from each other. This operation is performed in the most correct manner, by passing the plough twice in the same tract, which, when the land lies sloping or uneven, should be down hill the first time. The manure is then brought on in carts from the upper sides of the fields where they are hilly, the horses passing in one furrow, and each of the wheels in others on the different sides; they are then emptied by the drivers, who walk behind them with crooked three-pronged forks constructed for the purpose, leaving it in small heaps in the furrows in which the horses go, in sufficient proportions for the three drills. It is then divided and spread out in the different rows in as equal a manner as possible by women and children, the sets being put in upon it at the distances of about twelve inches from each other, the whole afterwards covered in by the plough, by splitting the ridges betwixt the rows, passing twice in the same tract as in opening the furrows for the rows.

There is another method of planting this root, that prevails pretty generally in the more dry districts, which is that of spreading the manure over the whole surface of the land in an equal manner after it has been well prepared by twice ploughing and harrowing; the sets are then planted in every third furrow, the dung and fine mold being turned upon them by the plough. This mode of set-



ting potatoes is probably the most adapted to those sorts of soil and situation in which the moisture is apt to be too readily dissipated, as by preserving a level surface it may be more fully preserved in the interstices of such porous soils. As the whole of the surface is in this way covered with dung, it is obvious, however, that a considerably larger proportion of manure will be necessary, than where it is deposited in the drills only; it must of course be an improper mode in situations where that article is not easily procured.

And in the county of Chester, where this useful root is extensively cultivated, it is most frequently the custom to form the land into narrow beds of about five feet in breadth by the plough, the manure, when necessary, being previously spread out evenly upon the ground, and turned down. The sets are then planted by means of a dibbling-stick to the depth of about three inches in rows, ten inches apart, and alternately ten and twelve inches in them, so as that the root-shoots of the plants may occupy the ground as completely as possible without interfering with or injuring each other. When the shoots of the plants first appear upon the surface, each of the furrows or divisions between the beds is dug out to the depth of about one spit; the loose earth thus raised being cast as evenly as possible over the plants in the beds, by which they, as well as any weeds that may have sprung up, are covered, and the growth of the former greatly promoted, while the latter are in a great measure destroyed. And in cases where the staple of the land will admit of it, in about a week or ten days afterwards a second covering is dug out and thrown over the crop in the same manner, by which its growth is still farther promoted. In this mode of planting, as much fresh earth is from time to time applied to the plants, their vigorous vegetation is not only secured, but the extension of the roots rendered more full and complete. As a quantity of fresh earth is thus annually furnished for the growth and support of the potatoe, it is asserted that repeated crops may be taken from the same land, even where manure is not made use of, without its being exhausted in any great degree\*. It may therefore be had recourse to with advantage where manure cannot be easily procured. And from its being well suited to the keeping of the soil dry, it may be well adapted to such lands as are inclined too much to the retention of moisture for the perfect growth of potatoe crops.

Where this sort of crop is planted upon sward-land, it has been recommended by an intelligent cultivator, after the land has been prepared by the use of a

\* Commercial and Agricultural Magazine, vol. I. p. 76.



plough that just pares off the surface and deposits it in the furrow, to place the sets upon the inverted sod, and cover them with the loose mold from below by means of a common plough \*. In this case the sets may also be put in by a dibble where that method is preferred; but the former is probably the better practice, as the turfy material on which the sets are put, in this method of planting, soon begins to decay, the purpose of manure is in some measure answered. It is therefore a plan that may be advantageous where manure is scarce, as in bringing waste and other coarse grass lands into the state of tillage.

These are the principal modes of planting that are employed where the plough is had recourse to; but where labour is cheap, crops of this sort are frequently set by the spade.

Where this is the case, after the lands have been once well dug over from the state of the sward, it is frequently a practice to form a trench across the end of the ridge to the width of about three feet, and from ten to fifteen inches in depth, according to the staple of the land. After this another trench of the same dimensions is made on the side of the former, the surface materials, to the depth of six or seven inches, being thrown into the bottom of the preceding trench upon which the proper supply of manure is laid, and the potatoe sets put in at the distance of eight or ten inches from each other, after which the necessary quantity of earth is raised from the bottom of this trench to cover the sets in the first, and bring it to its proper level. This, though a laborious method of proceeding, and not by any means calculated for the extensive cultivator, provides an excellent bed for the reception of the seed, and leaves the land in a high state of preparation for such crops as may be afterwards grown. Besides, as the grassy material answers the purpose of manure by its gradual decay, it may probably be had recourse to where that article cannot be easily obtained.

There is still another mode of planting the potatoe by the spade; which is that of forming the ground into beds of about six or seven feet in width, according as the land may abound or be deficient in moisture, three or four feet on each side being left to be dug for trenches. The surface of the bed is then to be dug over, and a suitable proportion of manure applied equally over it. The sets are then planted upon it at similar distances to these just mentioned, and covered by means of the mold dug from the side trenches, to the depth of three or four inches. In fertile good stapled soils, from the roots of the plants having plenty of loose mold to fix and extend themselves in, in this method of

\* Mr. Somerville.



planting good crops are often produced; but on the poor and thin sorts of soil it is a mode that can seldom be attempted with success. It is perhaps the best adapted to such lands as are inclined to the retention of moisture, as in such the largeness of the trenches has the effect of removing the injuries arising from the stagnation of water about the roots of the plants. This is generally termed the *lazy-bed* method of planting.

Where the shoots of the potatoes are made use of as sets, it has been advised to place them in half-drills, or such as are made by throwing the earth off on one side only, which may be formed by the spade, or even by a very small plough contrived for the purpose, at the distance of eight or ten inches from each other, after being carefully picked from off the potatoes, and seven or eight inches apart in the rows, the root of the shoot being put downwards. This may be performed by children. A small proportion of dung is then to be laid thinly over them, and the earth from the sides of the drills lightly drawn over them, so as to guard them against any frost that may happen. When they have thrown out leaves, and are about four inches above the ground, another covering is to be given, so as to leave about two inches above the surface; and as they advance in growth, continue to cover them in this manner, till the earth between the ridges raises the drills at least twelve or fourteen inches in height. Shoots that are employed in this way should be strong and vigorous, about six inches in length, and planted while fresh and in a state of perfect growth. The shoots may be preserved for planting by taking them off from the potatoes, either all at once or occasionally as they are used, without bruising, and laying them crossways upon each other, a light covering of earth being placed over them. In this way they may be kept a month or six weeks till the land is ready for their reception\*.

It has likewise been suggested, that crops of this sort may be raised by transplanting such young plants as have come up by chance on grounds that have had potatoes, or been prepared for the purpose in beds of rich earth and dung.

And it is indeed asserted to have been found by experiments attentively made, that planting the seed on moderate-sized dunghills for about three weeks before they are put into the ground, renders them forwarder by five or six weeks than in the ordinary manner, and that the heat afforded by the dung seems to communicate a healthy vigor to the plants that is maintained during the whole of their after-growth†.

\* Commercial and Agricultural Magazine, vol. VI.

† Farmer's Magazine, vol. III. p. 142.



But as much injury must constantly be done to the shoots of the plants in the operation of taking them up, and as roots of the potatoe kind seldom grow very well after being removed, it is probable that such a method of planting can scarcely ever be adopted with advantage, except in filling up the rows when defective, or in procuring more early crops, whether in the field or garden culture of the root.

In whatever method potatoe crops are put into the earth, experience shews that it is necessary that care be taken not to plant the sets to too great a depth, as the potatoe has a constant tendency to rise towards the surface; four or five inches is mostly sufficient in all the drier sorts of soil, and in those of the more moist and heavy nature less may be proper.

There is another circumstance that deserves great attention in the planting of this most useful vegetable; which is that of the sets, of whatever kind they may be, being deposited in or covered by such mold as is in a fine state of mellowness and pulverisation: as, where the earth by which they are surrounded is in a lumpy and unbroken condition, the crops are never so fine or productive. In proof of this, a striking fact has been recorded by a correspondent of the Board of Agriculture, who, on viewing a crop of about three quarters of an acre, planted by a gardener of the name of Watt, near Leicester, remarked that an eighth-part of it was at least six inches higher than the other part. On enquiry it was found that the land, which was of an equal quality throughout, was all prepared by digging in the same manner, had an equal proportion of manure applied to it, the sets being of the same sort, and most of them planted the same day; the only difference being, that on the part in which the crop was the most full and luxuriant, the planting was performed in drills made by a hand-hoe about a foot asunder, while the other, by accident, were put in by the dibble at the same distance. The superiority of the drilled over the dibbled part was easily perceptible during the whole of the summer, and to the period of taking the crop up, when it was nearly a foot higher in the stem, and about a month earlier, some of the dibbled being taken up at the same time, in order to shew the difference. The whole was hoed three times in the same manner during the summer; and when taken up, on comparing the different crops, the drilled was found to produce a quarter more than the dibbled. Besides, the potatoes were larger, and nearly a month earlier, both which are advantages of considerable importance\*.

It has also been suggested as necessary, where potatoes are planted in rows on

\* *English Encyclopædia*, art. Husbandry.



land without manure, or where the manure has been previously incorporated with the soil, to draw the furrows or drills much shallower than when the manure is to be placed below them, otherwise injury may be done by the crop being put in to too great a depth \*.

*After-culture.*—The proper management of the potatoe plant, after it begins to appear above the ground, is a point of great importance in its culture, as it is only by proper attention in this respect that full and abundant crops can be produced.

As it has been already seen that the roots of this sort of plant rise towards the surface while they are in a state of growth and forming their knobby bulbs under the ground, it must be obviously of great advantage to have the mold in a loose mellow condition frequently applied to them, as by such means the branching out of the stringy root-shoots or wires is not only greatly promoted, but the distension of the bulbs more perfectly secured, as well as the diligence of the cultivator fully repayed by the increase of produce. In order to effect these purposes, it is the general practice in the best-cultivated potatoe districts to have recourse occasionally, during almost the whole growth of the crop, to such means as pulverise, clean, and bring up the fine mold thus provided to the roots of the plants. These are the harrow, the hand and the horse hoe; by the former, the surface mold is rendered fine and powdery, while the latter is beneficial in bringing it up to the rows of the plants. In performing these operations, it is the practice of a cultivator who has had much experience in raising potatoe crops, to harrow the land over when the growths from the sets under the surface are advanced about an inch; which is only to be ascertained by inspection, as the germination of the sets varies considerably according to the circumstances under which it takes place. The above period is supposed the most proper, from the more advanced growth of the weeds rendering their extirpation more complete, as well as from there being danger of injuring the young shoots by breaking them off when delayed much longer. This process is conveniently performed by a small folding-harrow invented by the writer, which is drawn along the intervals by a single horse, in which operation it applies mold to the opposite sides of two contiguous rows, destroys the weeds, and pulverises the soil, without the inconvenience of levelling the ridges, which would not only eradicate and break off many of the roots and shoots, but prevent the advantage of their being kept dry. After this, when the potatoes are wholly up, the earth and weeds are to be removed from them by going as close as possible with an ebb furrow, and laid



into the middle of the intervals by a small plough with a very narrow earth-board. This is to be performed exactly under the above circumstances; as, when done earlier, there may be inconvenience from those plants that are not fully up being destroyed, and, when delayed much longer, there will not be an equal degree of benefit derived from the operation. It is likewise recommended that, in a few days after the first hoeing, the same implement be passed in the same tract to a greater depth. By thus stirring the earth in the intervals that had been trampled down by weeders or other means, it is rendered free, and the weeds that had been removed completely covered; and after the weeds, thus covered up in the intervals, are fully decayed and converted into new vegetable food, the earth is returned to the plants with a double-earth-boarded plough, by passing twice in the same tract, and turning a slight furrow to each side, the first being made down hill where the field is uneven, a person following the plough to remove the earth from such plants as may have been covered in the rows by the process, as, when left in that manner, their growth is either wholly prevented or very much restricted. And in places where the plants are left without having the mold applied round them, it is to be brought into contact with them by means of the hand-hoe.

After the plants have advanced to the height of about six inches, the earth is again laid up to them still higher by means of the double-earth-boarded plough, passing twice in the lines of the former earthings, but still considerably deeper than before. In this way the hoeing of the crop is completed\*.

By this method of constantly keeping fresh mold applied to the stems of the plants during the period of their growth, the produce has been found to be greatly increased, as it affords a facility to the wires for extending themselves in the loose earth thus laid up, as well as contributes to the perfect growth of the plants. It has been ascertained by different trials instituted for the purpose, that each separate hoeing or earthing up of the plants is useful in promoting a fresh set of runners, and that the potatoes are produced in tiers, according as the different hoeings have been performed; and it has also been found, that where the second and third earthings have not been attended to, the produce has been considerably diminished†.

In Lancashire the potatoe crops are mostly kept free from weeds by means of the plough, by turning the earth in the intervals of the rows towards the young plants as soon as they present themselves above the surface of the

\* Campbell in Bath Papers, vol. IX.

† Farmer's Magazine, vol. III. p. 145.



ground, and in a short time afterwards by turning it back again from each side of them; and occasionally, when the land is very foul, by passing a small triangular harrow between each of the rows. After the weeds have been removed in this way, the mold is again applied to the plants in the same manner as before, or by means of a double-mold-boarded plough. In this way the crop is rendered clean, and the fine reduced mold well laid up to the stems of the plants.

It is, however, the custom in some districts, where the planting of this useful root is performed on the plain surface without ridges, to depend upon repeated harrowing during the early growth of the crop, for keeping the lands free from weeds as well as for earthing up the plants; but it is evident, that by this method the ground, especially when inclined to be moist, is not only rendered too flat, but little assistance afforded from the small portion of mold that can be brought to the root stems of the plants. Besides, these operations can only be continued for a short time during the early growth of the crop. As it is attended with less expence, it may, however, be practised where the soil is light, thin, and liable to become too dry. But, in general, the more perfect and the longer the stirring of the ground between the rows can be continued, provided the implement does not press too deep in the latter ones, the more vigorous and abundant the crops will be.

The earthing up of crops of potatoes by means of the plough has been objected to by some cultivators, on the principle that it has a tendency to injure or destroy the knotty wires of the plants that extend themselves laterally; but this can seldom be the case when the plants are put in at proper distances, and the operation carefully performed; but, in order to remove any danger in this way, the process may be well executed by means of a sort of cultivator termed a *brake*, which is much employed by the Kentish farmers for this purpose, as well as for cleaning and earthing up different sorts of podded crops.

Mr. Billingsley, however, on the authority of much experience, advises that the hoe be never made use of after the potatoe plants have begun to throw out their wires or strings, and form their bulbs; as, should weeds afterwards arise, they may be removed by means of hand-labour.

The expence of cultivating crops of this root, though it will vary much according to the nature and condition of the soil, the method of planting, and various other circumstances, yet, from the preparation and labour necessary in bringing the ground into a suitable state for the reception of the seed and in putting it in, it must constantly be high. It may in general be stated to



be from about five or six to eight or nine pounds the acre, according to the differences of the land, and the difficulty of obtaining labourers\*. Crops of this sort are not, however, to be considered merely in regard to the immediate profit they may afford, but also as the means of preparing and bringing the lands on which they are produced into a suitable condition for the growth of grain. As the cultivation of roots of this nature answers the purpose of an expensive summer fallow, the farmer has an advantage even where they only repay the expences incurred in manure and other articles; but they will mostly, where proper attention is bestowed, do considerably more, notwithstanding the heavy expence of preparing the ground, and planting such crops.

It has been advised by some cultivators to cut away the parts of the potatoe plants which contain the flowers before the blossoms begin to blow, in order to increase the size of the potatoes; but this is a practice that has been shewn to be too tedious to be generally adopted, though it seems probable that the production of the fruit or apple may be detrimental in drawing away the nourishment of the bulbs below the ground at the period when they stand most in need of it. And, in the few trials that have been made in this view, some have supposed an advantage to be derived from it; as after planting different kinds in drills, and picking the flowers carefully from off the plants in some of them as soon as they appeared, in others after they had expanded or even made some progress towards setting the fruit, and in others again after it was formed and half-grown, while other drills between them were left untouched, it was found

\* In the West Riding of Yorkshire, according to the Agricultural Report of that district, the expence and profit on an acre of potatoes are thus stated:

| Expences.                                |    |       | Produce.                             |    |       |
|------------------------------------------|----|-------|--------------------------------------|----|-------|
|                                          | £. | s. d. |                                      | £. | s. d. |
| Land rent . . . . .                      | 1  | 5 0   | By 60 sacks, at 5s. 6d. per sack . . | 16 | 10 0  |
| Working and ridging . . . . .            | 1  | 5 0   |                                      | 8  | 1 0   |
| Seed potatoes, six sacks, at 7s. . . . . | 2  | 2 0   |                                      |    |       |
| Cutting ditto, and setting . . . . .     | 0  | 2 0   |                                      |    |       |
| Manure and leading . . . . .             | 2  | 2 0   |                                      |    |       |
| Hoeing, weeding, and taking up . . . . . | 1  | 5 0   | Profit                               | 8  | 9 0   |
|                                          | 8  | 1 0   |                                      |    |       |

Various estimates of expence and produce on a large scale, under different modes of preparation and planting, may be seen in an ingenious paper by Mr. Billingsley, in the sixth volume of the Letters and Papers of the Bath Agricultural Society.



that the crop, in the first method of plucking the blossoms, was in most cases nearly double to that in which the apples were permitted to become ripe. Where the flowers were suffered to waste themselves only, the crops were less productive; and where the apples had made some progress, it was still smaller; but in both considerably greater than in the untouched rows. It was likewise remarked, that the stems of the plants, in the cases where the blossoms had been picked off, continued in a more full and vigorous state of growth much longer than where they were permitted to remain. And the same circumstances took place where the apples were gathered early\*.

The trials of other experimenters seem, however, to contradict these statements; as in plucking the blossoms from some drills, and leaving others in their natural state, on taking up the crops not the least perceptible difference could be perceived in the produce†. But though beneficial consequences may perhaps in some instances be produced by the pulling off the blossoms of potatoe plants, in order to prevent the seed from being formed, as is the practice in particular cases in gardening, the experiments of different writers have clearly shown that the cutting over the haulm or straw is invariably injurious to the success of the crops, the large produce and great luxuriance of the plants probably requiring the assistance of the leaves and stems to perfect their growth. When cut at different stages, in some trials the deficiency of the produce was found to be exactly in proportion to the earliness of the operations being performed; and that the potatoes were badly ripened, as well as of a bad quality, while those growing on the same land close to them, but in which the haulm had been left uncut, were extremely good‡. It has indeed been recommended by an experienced cultivator of this root, never to cut the stems of potatoes at any period of their growth; as the roots not only continue to improve till the stems have decayed so as to be of no utility, but cease the instant they are deprived of them||.

*Curl.*—Besides the injury that may arise to crops of this sort from the above practice, they are frequently liable to be much hurt by the *curl*; a disease in which the leaves of the plants are, as it were, shrivelled or curled up, and the healthy appearance and vigor of the crop greatly impaired. The reason of this pernicious vegetable affection appears not yet fully investigated, as it has been ascribed to many different causes by writers on husbandry. Most of early au-

\* Farmer's Magazine, vol. II, p. 412.

† Ibid. vol. III. p. 103.

‡ Ibid. vol. II. p. 412.

|| Campbell, in Bath Papers, vol. IX.



thors considered it in general as originating from distempered seed, which caused it to appear in the crops wherever it was made use of. But in an interesting paper in the second volume of Communications to the Board of Agriculture, it is suggested as proceeding from imperfect culture, or such circumstances as have a tendency to lessen and impair the vigor of the growth of the plants; as the improper nature of the soil, or the want of sufficient preparation of the land on which the crops are grown. It has likewise been supposed to owe its origin to the continued propagation of potatoes by subterraneous buds, or root-wires, instead of seed, as by such means they acquire hereditary disease; as happens in gardening, in the case of canker, to such apple-trees as have been a great length of time propagated by grafting the scions. In opposition to this, it has, however, been maintained by some cultivators, that they have found the curl to prevail in the potatoe plants in such crops as had been raised from seed of the second year. By others it has also been asserted, that insects attacking the leaves may be the cause of the curl; and still others, that the potatoe roots, the leaves of which are attacked with the curl, remain hard and less dissoluble in the soil\*.

And it has lately been contended, that this disease in potatoe crops proceeds from insects beneath the ground destroying the nutritive part of the sets after they are deposited in the soil; as it was found that, from a potatoe planted in a field as seed, there proceeded four stems, two of which were weak and delicate, having their leaves attacked with this disease, while the other two were in a highly vigorous state, and their leaves fresh and free from the curl. On the root being taken up, it was discovered, that all the part from which the curl-leaved stems proceeded was excavated, the substance being wholly consumed by insects. And on more frequently examining such roots as had their leaves affected, it has constantly been found that they have been destroyed by insects, either of the snail, centipede, or beetle kind. Sometimes it is, indeed, supposed, that the disease may be caused by the leaves only becoming the prey of numerous minute animalculæ, but that the general cause is in the seed itself being consumed.

On this account it is, therefore, that the disease abounds more in potatoe crops in the rich soils in the vicinity of cities, and in that of well-manured gardens; as in such, insects are the most predominant.

It is also suspected that some sorts of potatoes are more liable to be attacked

\* *Phytologia*, p. 475.



by animals of the above kinds than others, as they have scarcely ever been observed to meddle with the yam. Such varieties of the potatoe as have been brought from backward districts, and which have not been perfectly ripened, are likewise, it is thought, seldom relished by these insects. But such as have been made in any degree sweet and mellow by the action of frost, are sure to be attacked by them \*.

As the general experience of cultivators has fully shewn that the crops of such potatoe sets as have been brought from high cold climates, where the potatoe scarcely ever arrives at that state of perfect maturity in which seed is produced, is rarely if ever affected with the curl for the first year, this opinion is rendered extremely probable †.

And the trials of a very extensive cultivator not only clearly demonstrated that there was not the least difference in respect to the production of this disease, whether whole potatoes, large cuttings, small cuttings, or the eyes merely, were employed; but that such potatoes as were brought from the late districts about Dumfries in Scotland, were never known to afford curled crops the *first* year. The cultivator is, however, cautioned against using them in the third year, as, however rich the land or good the manure may be, they will almost all be affected with the curl if set in the same soil ‡.

It is added by the former of these experimenters, that the produce of such potatoe plants as have once been under the influence of this disease will constantly, if planted in the same ground, continue to produce diseased crops §.

There is still another cause to which this baneful disease in the leaf of the potatoe plant has been ascribed; which is, that of the season. It is remarked, that where the early part of the season is mild and warm, in such a degree as to permit the plants to vegetate and spring up in a perfect manner and to establish themselves well in the ground, there will be little or none of the disease; but that where the crop has been planted at too early a period, or where the advance of warm weather is slow and late, the disease will shew itself in a high degree. Thus, where the spring is late, cold, and frosty, and the potatoes set at an early period, the crop is mostly injured by the curl; while those that are planted at a later period, and which are not so much exposed to the effects of cold and frost in their early growth, are more free from the disease. In proof of this, it is observed, that potatoes planted on elevated, hilly, and moist situations,

\* Farmer's Magazine, vol. III. p. 217.

† Ibid.

‡ Billingsley, in Bath Papers, vol. VI.

§ Ibid. p. 218.



which cannot be set so early as in lower and more warm districts, and which seldom appear perfectly above the ground before the latter end of May, are almost wholly free from the curl, on which account they are generally had recourse to as seed.

But though many of these different causes may operate in producing a tendency to the production of the curl in potatoe crops, they do not any of them seem fully sufficient to account for the disease in a perfectly satisfactory manner. Further investigation into the nature of the disease is still wanting, in order fully to elucidate its cause. It appears probable, however, that imperfect culture, too early planting, cold, frost, and backward seasons, or other causes that have a tendency to diminish the vigor of the plants in the early stages of their growth and bring on a state of debility, may render the stems as well as leaves more sweet, and consequently more liable to be devoured by the attacks of animalculæ, at the same time that, from the imperfect consumption of the sweet nutritious material elaborated in the set for the support of the young plant, in such cases, the roots may be more exposed to become the prey of insects, and in this way the disease be produced. That something of this nature takes place seems evident, from the circumstance of only some of the plants being diseased, while others nearly adjoining them are in a healthy and luxuriant condition.

But from whatever cause this vegetable malady may take its origin, no effectual remedy seems yet to have been discovered, but that of a frequent change of seed, and having recourse to such as is brought from a distance, and from such districts as are later, and have soils different from that in which they are to be planted. Where the convenience of shipping admits of it, the best method is probably to have the seed potatoes from Scotland, or some of the northern counties of England; as experience has shewn, that seed potatoes from these parts of the island seldom produce many diseased plants for the first or second year\*. Where insects or animalculæ are considered as the cause of curl, the changing of the seed must also be a principal mean of preventing the disease, as in this way we have just seen that such kinds of potatoes may be employed as they are not disposed to attack. But, besides this, it may be advisable to have this sort of crop planted as little as possible on the rich field or garden soils that have been long in a state of tillage, and which of course abound most with insects.

\* Billingsley, in *Bath Papers*, vol. VI.



And as it has been found that the produce of such potatoes as have been once affected with the curl will, when planted on the same land, uniformly continue to afford curled plants, a change of the seed of the potatoe may in all situations be more essentially requisite than that of most other sorts of crops.

It has likewise been remarked, that on taking up the potatoes in a field that had been partly planted with such seed as had been produced on the land, and partly by that from a colder climate, and consequently a later, that the produce in the former case was at least in the proportion of three to one less than in the latter\*.

In the idea that the disease is produced by the devouring attacks of insects on the sets, it seems not improbable but that advantage might also be derived from the impregnation of them with such liquid substances as they are found to avoid, or which are noxious to them, in the way of steeps. In performing this, great care should, however, be taken that such materials be not employed as have a tendency to injure their vegetative quality.

Besides these, it may be of great utility in guarding against the disease to be particularly attentive to the preparation of the ground, the proper season of planting according to the nature and situation of the land, and to the accurate after-culture of the crop; as there is reason to suppose, that where these points are either wholly neglected, or performed in an incomplete manner, the crops are more liable to be injured by the curl†.

In Mr. Chapple's experiments, considerable advantage seemed likewise to be derived from selecting the best and most perfect potatoes for seed, from such as had been grown upon a piece of ground set apart for the purpose at a distance from the others, and during the after-culture of the crop picking out the diseased plants‡.

It has also been lately suggested, that by using the dark brown-coloured excrescence that grows to the size of a large horse-bean on the haulm or *straw* of the potatoe near to the ground, or what is termed in some places the *potatoe bean*, for feed, the curl may be prevented. These beans have the form of the potatoe, and present a number of eyes, from one of which two small leaves generally issue.

In an experiment made with these, in order to ascertain their vegetative property, it was found that they produced a large number of potatoes of the ordinary size, but of inferior quality. These, however, on being cut and planted

\* Farmer's Magazine, vol. III.; and Bath Papers.

† Communications to the Board of Agriculture, vol. II.

‡ Bath Paper.



the following year, afforded potatoes of an excellent quality, and in great abundance. Encouraged by these trials, a sufficient proportion of this sort of sets has been annually collected and planted for the purpose of supplying seed for the ensuing year's crop. It has been the invariable practice of the cultivator to plant them at the same distance as in the ordinary method for those of common sets, and to manage the crops every way in a similar manner. The quantity of produce has mostly been equal to that with the common seed: and under this plan, it is asserted no other change in the seed has ever been found necessary\*. But however effectual such a method may be in preventing the curl in potatoe crops, it is obviously too tedious and expensive to be introduced into the field culture of the root with advantage. Yet, if further experience should confirm the above, it seems not improbable but that it might be an useful practice in the more limited scale of garden culture.

The produce of this sort of crop is shewn to have attained the full size, and to be in a proper state for being taken up, by the leaves beginning to wither and fall off, and the stems to decay; after such appearances, they should, therefore, as soon as possible, be removed from the ground, in order that they may be secure from the danger of frost, which is sometimes apt to take place about the period when the late-planted crops become ripe. About the latter end of September, or beginning of October, is the season in which the general crop is mostly taken up; but the garden and other early crops may be taken up at any time, so as to suit the particular views and convenience of the cultivator, after the stems have attained their complete growth, which is known in most cases by the production of blossom.

The manner of performing this business is different, according to the extent of the crop, and the mode in which it has been planted. In the garden, and where the space of ground occupied by it is but small, digging the potatoes out by means of a broad three-pronged fork is probably the best practice; as in this way the ground may, at the time the potatoes are taken up, be dug over, and left in an even and regular state: but where the crop is of considerable extent, and the land not of so light and mellow a nature, but planted in drills for the use of the horse-hoe, the plough may be the most economical, as the earth seldom digs well.

For this purpose, it will only, however, be necessary to make use of a light plough without any coulter, turning up the earth of the rows by the share; as by

\* Farmer's Magazine, vol. III. p. 13.



that means the potatoes are less in danger of being injured. In this method, in some cases, it is the custom to set the share against the rows to a good depth, and at once turn them up; while in others it is the ordinary practice first to turn a furrow from each side of the drills, and afterwards to plough up the middle part, in which most of the potatoes are lodged. And in some other cases, after the side furrows have been removed, it is usual to turn over the part that principally contains the potatoes by hand labour with a three-pronged fork\*.

In whichever way the crop is taken up, the haulm or stems should first be cut off close by the surface of the ground, or pulled up and removed from the land. Where the crop is taken up by hand-labour, one person will generally be sufficient for picking up the potatoes; but in taking them up by means of the plough, the number must be increased according to the circumstances of the crop, always being sufficient to keep up with the plough, otherwise there will be great loss in the economy of time from the team occasionally remaining unemployed.

Some likewise recommend the land to be once or twice harrowed over afterwards, in order to bring such potatoes as may have escaped the pickers to the surface†.

In accomplishing this work, it is of much advantage to separate the small and bruised from the middling and large potatoes. It is likewise of consequence to choose as dry a time as possible for the business; as when this sort of crop is taken up wet, it is never found to keep well. After the whole of the crop has been raised from the ground, it should be spread thinly upon a dry floor, and be allowed some days in order that it may become perfectly dry before it is deposited in the situation in which it is to remain during the winter.

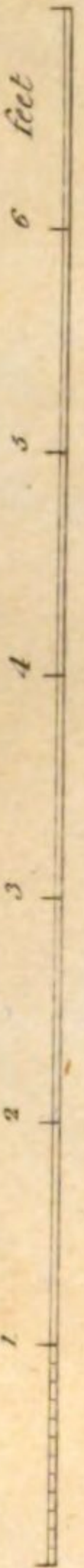
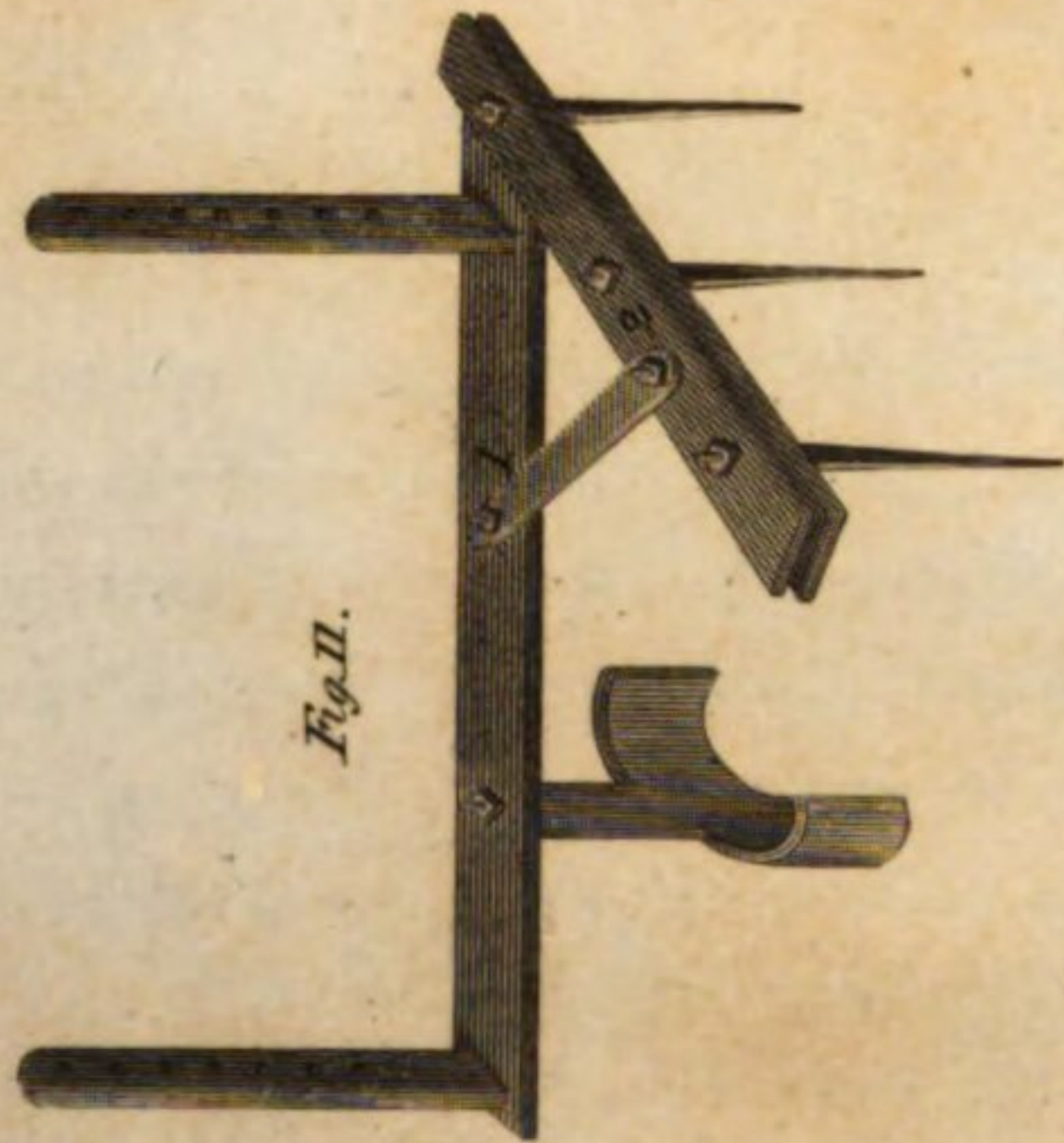
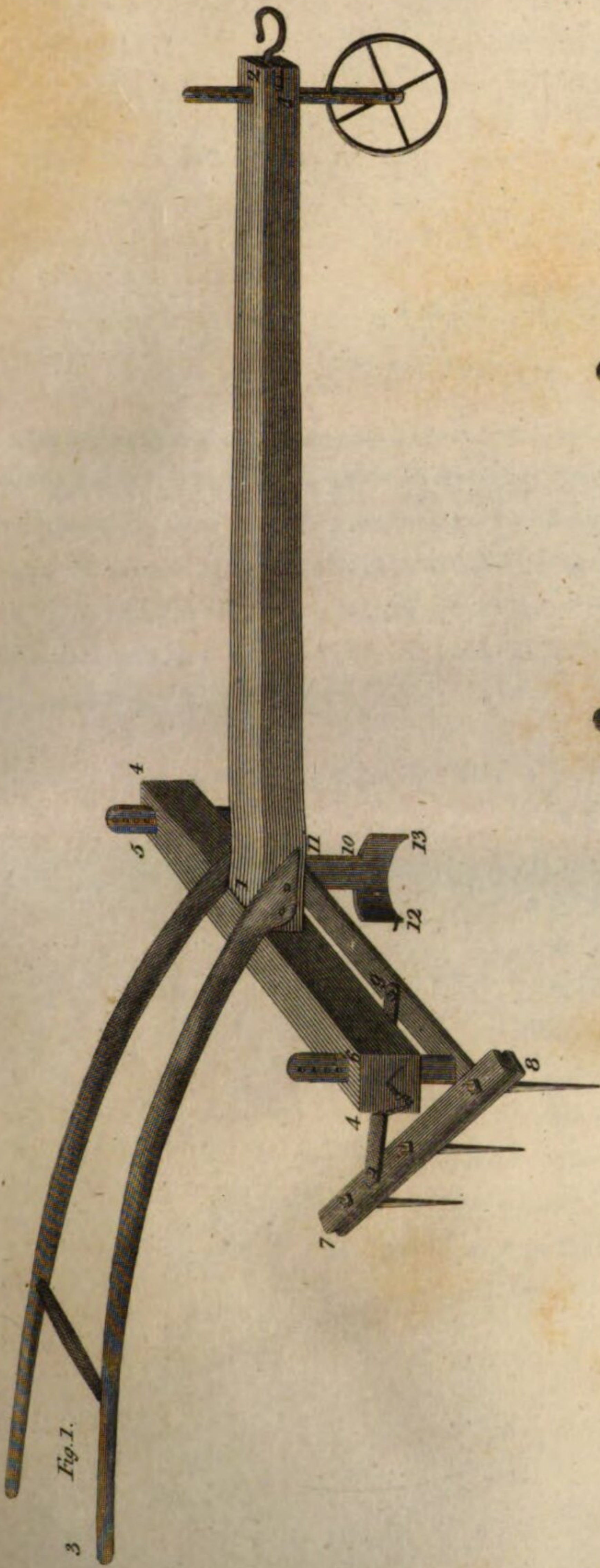
The produce in crops of this as well as other kinds must vary much, according to the circumstances of soil, cultivation, and season. It has been stated by Mr. Donaldson to be from five to eight or ten tons, and on the average over the whole kingdom about six tons, to the English statute acre. In Mr. Billingsley's extensive experience in the growing of this vegetable, he appears never to have had a greater produce than about a sack in a perch of ground, or one hundred and sixty sacks on the acre, of the eating kinds of potatoes; but he is aware that a much larger produce may be obtained of those sorts employed in the feeding of cattle, though he seems to think them less nutritious. In Yorkshire, according to the Agricultural Report of that district, from three to four

\* *Modern Agriculture*, vol. II.; and *Lancashire Report*.

† *Experienced Farmer*, vol. I.



POTATOE HARROW.





LIBRARY OF THE

UNIVERSITY OF

CHICAGO

1891



# PLATE III.

## Potatoe Harrow.

[To face Page 630, Vol. II.]

CONTAINS the representation of a Harrow contrived by Mr. Young, for the purpose of preventing the great labour and expence of breaking the furrow slices in taking up potatoe crops by the plough: it is worked by a man and horse. The curved iron slides against the unploughed land, at the bottom of the open furrow, and thereby keeps the teeth diagonally placed, to avoid driving the earth in heaps in their work. In friable soils three teeth may be employed, but in stiffer ones only two. It is a tool that performs its work well, and which has saved in his practice from 17s. to 20s. an acre.

*Ft. In.*

|                                                  |   |   |                        |
|--------------------------------------------------|---|---|------------------------|
| The dimensions in <i>Fig. 1.</i> are from 1 to 2 | — | 5 | 8                      |
| 1 to 3                                           | — | 4 | 6                      |
| 4 to 5                                           | — | 2 | 6                      |
| 4 to 5                                           | — | 0 | 5                      |
| 4 to 6                                           | — | 0 | 5                      |
| 7 to 8                                           | — | 1 | 9                      |
| Plate 9                                          | — | 0 | 3 broad.               |
| Do.                                              | — | 0 | 0 $\frac{1}{2}$ thick. |
| 10 to 11                                         | — | 0 | 5 $\frac{1}{2}$        |
| Do. breadth of the iron                          | 0 | 3 |                        |
| In the curve                                     | — | 0 | 7                      |
| Breadth of curved iron                           | — | 0 | 3                      |
| 12 to 13 straight line across.                   |   |   |                        |







hundred bushels of these sorts that are commonly made use of at the table, are considered as a good produce; but those cultivated for cattle purposes mostly yield from fifty to one hundred bushels in addition\*.

In some cases, in the county of Kent, four bushels are said to have been dug up from a single square rod of ground, which is at the rate of six hundred and forty bushels to the acre; which, at the price of only one shilling the bushel, would afford thirty-two pounds as the value of the produce†. Crops do not in general, however, afford by any means so large a profit.

Still larger quantities have, indeed, been asserted to have been produced in particular cases in the trials of different cultivators, as from seven hundred to a thousand bushels; but in such instances the land must have been very rich, and peculiarly suitable for the purpose, and the season unusually favourable to the crops.

Many different methods of preservation have been attempted in order to prevent the injurious effects of frost, moisture, and germination, on the potatoe, during the winter and early spring seasons: as by the first it is rendered wholly useless as an article of food; dampness makes it quickly liable to become rotten; and by sprouting its flavour is considerably impaired, consequently it is less proper for the purpose of eating: but no perfectly effectual and at the same time convenient mode seems yet to have been discovered. As by too much humidity and heat the vegetative process may be excited too expeditiously, while on the contrary the destruction of the vital principle may have a tendency to hasten the putrefactive fermentation, the great art of obviating such effects in this as well as other roots, when removed from the earth, would seem to consist in preserving

\* The value of the gross produce of potatoe crops under different methods of cultivation is thus stated by Mr. Campbell, in the ninth volume of the Bath Papers:

## EXPERIMENTS IN 1794.

| Rows.                                                     | Value of gross produce per acre. |    |                   |
|-----------------------------------------------------------|----------------------------------|----|-------------------|
|                                                           | £.                               | s. | d.                |
| 1. Undunged potatoes after dunged turnips . . . .         | 25                               | 19 | 8 $\frac{3}{4}$   |
| 2. Undunged after dunged fallow . . . .                   | 27                               | 10 | 2 $\frac{6}{12}$  |
| 3. Undunged substituted for a summer fallow . . . .       | 14                               | 10 | 4 $\frac{1}{12}$  |
| 4. Purple-hearted dibbled in the top of a well-dunged row | 48                               | 10 | 6 $\frac{4}{12}$  |
| 5. White kidney planted in same manner . . . .            | 27                               | 2  | 5 $\frac{4}{12}$  |
| 6. Ditto, ditto on much dung in row . . . .               | 29                               | 0  | 9 $\frac{6}{12}$  |
| 7. Ditto, ditto on little dung in row . . . .             | 24                               | 16 | 8 $\frac{10}{12}$ |
| 8. White flat potatoe on ditto, ditto . . . .             | 30                               | 19 | 0                 |

† Banister's Synopsis of Husbandry.



them in such a state of life, and in such situations, as that they may not be liable to receive injury by too high degrees of either heat or cold, or by excesses of moisture. This may be accomplished by keeping them perfectly dry, and as much as possible in a medium degree of temperature, between the extremes of about forty-eight and thirty-two of Fahrenheit's thermometer; in the former of which the process of germination for the most part takes place, and in the latter the destruction of the vitality of the roots by the occurrence of frost\*. Such a steady temperature, under the constantly varying circumstances of this climate, is not however easily attained, and the roots at the same time preserved in a state of sufficient dryness. It has, notwithstanding, been attempted by burying them in pits below the surface of the ground, by depositing them in vaults and cellars or other similar situations, and by placing them in houses constructed for the purpose.

The first method, though practised in many districts, is seldom completely successful, except where the soil is of a very dry and porous quality, and the inclosing of the potatoes conducted with great care and attention. And, indeed, whatever care may have been bestowed in the storing of them in this manner, there is mostly danger from their becoming too much impregnated with moisture from the surrounding earth, and from the closeness and warmth of such situations disposing them to vegetate too quickly in the early spring months. Where it is employed, the best means of guarding against these effects is, however, to have recourse to pretty thick linings, of such substances as, while they resist the effects of cold, have but little capacity for transmitting heat or absorbing moisture. In this view, all sorts of coarse, woolly, or hairy materials, straw, fine shavings, saw-dust, and many other similar matters, may probably be made use of with advantage. And on the principle of absorbing or taking away such putrid exhalations as may be generated among bodies thus closely packed together, as well as from its indestructible nature, the coarse powder of charcoal has been advised. This is first to be applied over the roots to an inch or two in thickness, and afterwards layers of one or more of the other materials to such depths as may be sufficient to preserve them in the proper state of temperature, and protect them from frost†. The business of *pieing* potatoes is managed in somewhat a different manner in different districts: in some the ground is excavated or hollowed out to the depth of two, three, or more feet, and the potatoes deposited in the pit, as well as piled up considerably above it, so as to terminate in a sort of point or

\* Darwin's Phytologia, p. 483.

† Ib'd.



ridge; in others they are only, however, piled up on the level surface in the same forms; but whichever method is adopted, the custom is mostly to cover them with dry straw, about five or six inches in thickness, and afterwards apply over it a good thick covering of earth, raised from a trench dug out all round the heap, and well beaten together by the back of the spades over the whole. It is likewise the practice in some instances to perforate the crusts or coverings of these repositories, both on the sides and about the tops, with small holes to the depth of the straw, and at the distances of about two or three yards from each other, in order to let any noxious effluvia, that may have been extricated, escape, but which are to be well closed as soon as this purpose has been fully accomplished\*. This would, however, appear to be quite unnecessary where the potatoes have been put together in a perfectly dry state, and the bruised or wounded ones have been carefully separated from the rest; but when the contrary is the case, the fluid discharged from them may have a tendency to bring on or run into fermentation, and thus injure such as come near or in contact with them.

This mode of preservation is, however, only adapted to situations where the soils are of a dry, gravelly, or sandy nature; as the retention of moisture in those that are of the more heavy kind must constantly endanger the safety of the root. And as even the driest descriptions of soils are apt, in particular instances and seasons, to become loaded with much humidity, it is probably the best mode to sink the pits as little as possible in all cases, as in this way the risk of injury may be less.

It has been recommended, that the situation of these repositories should be such, as that one of the ends may constantly face the north, and that they be always thatched over upon the earthy coat with straw in the manner of corn stacks, as by such means the danger of frost and moisture is more effectually guarded against†. In addition to these, where this method is followed, it is also probably useful to have recourse to some of the other materials besides straw for forming the internal coats or coverings to the potatoes. And as much inconvenience as well as risk attends the opening the heaps, it may be advisable not to have them too large, as by attention in this respect the whole may be removed at once, and almost immediately converted to use.

But in whatever manner this method may be performed, it seems to be less convenient as well as less secure than that of storing them in deep dry cellars or vaults of other kinds, where they can not only be easily removed as occasion may

\* Corrected Report of Lancashire.

† Experienced Farmer, vol. I.



require, but be more perfectly safe against moisture. In this mode, the same attention will, however, be requisite in the covering of them up in the winter months as in the others.

The most perfect practice is perhaps that of having houses constructed of suitable materials expressly for the purpose, as in this way the constant trouble and expence of covering and uncovering may be avoided.

Where the cultivation of this root is carried on to a considerable extent, and the produce kept during the winter and early spring months, it may, therefore, be advisable to have a house constructed for the purpose, somewhat on the principle of the dairy-house, or so as constantly to preserve as much as possible an uniform state of temperature between the extremes that have been mentioned, in which the potatoe is found to remain in a perfectly sound and uninjured condition. For such a building a perfectly dry situation, and which is as little exposed to the sun as possible, should always be chosen. In very dry soils it may be the best method to have it sunk something below the surface of the ground, both for the convenience of preserving and storing the crops; but in such as are more retentive of moisture, it will be better to have it wholly above the level of the surface, in order more fully to guard against the effects of dampness. The outside walls may be of earth, well-wrought clay, or any other dense material; but of whatever substances they may be formed, they should be constructed double, or in such a manner as that some kind of light material, such as sawdust, coarse hair, fern, straw, &c., which has a tendency to resist the action of severe frost, may be lightly stuffed in betwixt them: and the roof, after being well boarded over, should be covered with an extremely thick coat of good wheat or rye straw. The door may also be formed double in the same way as the side walls, and be so contrived as, on being opened, to prevent the entrance of the air as much as possible, being always placed in that part of the building that has a southern aspect. By this sort of house, and proper attention to the nature of the materials of which it is formed, it seems not improbable that potatoes may be equally guarded from the danger of intense frost and that degree of heat which is necessary to their germination in the early spring season. It has, indeed, been suggested, on the principle that clay or earth constitutes the warmest building for the winter season, and the coolest for that of the summer, that houses made wholly of such materials might answer well for the preservation of potatoes\*. It is obvious, however, that where such substances are employed alone, they must be less proper, on account of their disposition to

\* *Farmer's Magazine*, vol. III. p. 318.



absorb and retain moisture, and the necessity of their being made use of to a very great thickness, as well as from their being extremely liable to crack and form openings; inconveniences that are in a great measure avoided in the method just described, and at the same time the potatoes more perfectly secured.

Besides these means of preserving potatoes from injury while in their perfect state, others have been suggested as capable of being employed with success without the great expence of fire, where they are reduced into less bulky forms. These are chiefly by bringing the substance of the potatoes into a pulpy state, either by rasping, pounding, or grinding, by machines or mills constructed for the purpose, and afterwards confining the pulp in a cloth, and reducing it into the form of a thin cake by means of pressure. The cakes, after this, are to be well dried, by placing them upon shelves, and turning them frequently. In preparing potatoes in this manner, it was found, that such potatoes as were peeled thinly before they were reduced into pulp afforded more clean white cakes, and such as appeared to keep better, than where they were merely cleaned and formed into cakes without peeling. And that, though the substance of the root is compressed into a sixth of its ordinary bulk, and loses nearly two-thirds of its weight in the process, yet on being dressed, either by steam or in any other manner, it affords almost the same proportion of food. Besides, by the addition of water in an equal quantity to that of the juice, which is forced from the pulp during the time of its compression, a portion of fine white flour or starch proper for the better sorts of pastry is deposited.

It is conceived that, by a machine of considerable power, the cakes might even be formed at once, by merely pressing the potatoes, without their having undergone the preparation mentioned above, the black specks and other impurities only being first removed; and that a common cyder or cheese press, with the assistance of a lever to increase the power, might be employed for the purpose\*.

This mode of preserving the substance of the potatoe may be highly beneficial in many instances, but particularly where it is necessary to be kept a long time, and used in large quantities, as it is said to be capable of being packed in one-sixth the space that would be requisite under other circumstances, and to remain perfectly good many years†.

It seems probable likewise that potatoes might be rendered capable of keep-

\* *Commercial and Agricultural Magazine*, vol. II. p. 256.

† *Ibid.*



ing sweet and good for a considerable length of time without undergoing the above process, by being cut in thin slices, and exposed to heat in a gradual manner in an oven or upon a stove or kiln until the whole of their moisture is expelled and they become perfectly dry, when they should be inclosed in casks or other vessels, and placed in dry situations.

And it is stated by a late practical writer, that this root may be kept perfectly sound for a long time, merely by spreading them thinly on a dry floor early in the spring, and carefully rubbing off the eyes or sprouts as they appear\*; but the flavour of the potatoe appears to be considerably altered as soon as the process of germination takes place, the whole substance being rendered more soft and sweet, consequently less palatable.

This root, joined with hay, straw, chaff, and other similar matters, has been found useful in many cases, especially in the later winter months, as a food for horses and other sorts of live stock; and with these substances, as well as in combination with other materials, as bean or barley meal and pollard, in the fattening of neat cattle, sheep, and hogs: but as there is considerable trouble and expence in preparing them, it being found that they are much more safe and nutritious for such animals when boiled, they do not appear to have paid greatly when employed in this way. The results of numerous trials detailed by different writers in the *Annals of Agriculture* do not shew them to have been in this mode of application worth more in general than from four pence to five pence the bushel. When given to horses, it may be something more, as there is more difficulty in ascertaining the savings in other articles of fodder that are thereby made, and the advantages that are gained by the animals. It has been stated to be about ten pence the bushel†.

The most general as well as the most useful application of this sort of crop is in that of human food, for which purpose the roots are rendered mealy, nutritious, and fit for undergoing the different processes of digestion, by means of heat, either in water or steam, their acrid juices being in this way converted into mucilage, and probably some portion of that into a fine farinaceous or starchy substance. Experience seems to prove, that where the heat is properly applied through the medium of steam, the potatoes become more mealy and nourishing than where water is made use of for the same purpose. But the differences in the mealiness produced by the boiling of this root is supposed by

\* Donaldson's *Modern Agriculture*, vol. II.

† *Annals of Agriculture*, vol. XXIX, p. 62.



some to depend more upon the nature of the soil on which it is grown than on any other circumstance. And it has been suggested, that the mealiness of some potatoes that have undergone the operation of boiling, may be sometimes affected by the acidity of the water in which they have been boiled: but it is believed to depend more generally upon the mucilage in some of them being more coagulable than in others, a circumstance the cause of which has not yet been fully investigated\*.

The washing of this root, where it is employed upon an extensive scale, is frequently a troublesome operation; it may, however, be performed with great ease and convenience, by having a vessel constructed somewhat in the form of a barrel, with small strong narrow laths on the sides, nailed to the solid boards, forming the ends at such distances as may be sufficient for preventing the potatoes or other roots from falling through, and at the same time for admitting the water to pass freely. The potatoes are to be introduced and evacuated by means of a door fixed in one of the sides. The vessel being thus prepared, is to be hung upon a frame of wood over a large square tub containing water, in such a manner as that about one half of it may be immersed; a crooked handle projecting at one of the ends, by quickly turning which, when the potatoes are put in, a large quantity may be expeditiously washed. There should likewise be a contrivance in the frame higher up and nearer the side of the cistern for lifting the barrel, from the place in which it turns, into, in order that, by opening the door and turning it round, the washed roots may be easily delivered into a barrow or other vessel placed below and appropriated to their reception.

There is still another circumstance in regard to potatoe crops that deserves to be noticed, which is the effects they produce on the soil. It seems probable, both from the nature of the root and the large portion of manure that is necessary to insure a good crop, except under particular circumstances of the land, that the potatoe is a sort of plant that has a tendency to draw a large quantity of nourishment from the soil on which it is grown, consequently to exhaust and impoverish it in a considerable degree, though these injurious effects are in some measure counteracted by the great abundance of stem and the closeness of the foliage, producing a stagnated state of the air, and a considerable deposition of vegetable and other matter on the surface, as well as by the pulverisation and aration that is afforded in the culture and removal of the crop from the ground. It is perhaps in this way only that the

\* Darwin's *Phytologia*, p. 450.



contradictory accounts of the effects of this sort of crop on the soil, and the occasional successive production of full crops on the same land, can be well reconciled. The experience of potatoe cultivators in general appears, indeed, to support the conclusion; as upon the more strong and heavy sorts of soil, where benefit can be produced in the above manner, full crops may often be taken in succession without much injury being sustained; while on the lighter kinds, where much less advantage is derived in this way, they become too open and exhausted for the successful repetition of this sort of crop, and even for the growth of wheat \*. And in Mr. Young's trials with the potatoe, introduced in a great many different courses of crops, it was found that the state of deterioration of the soil was in proportion to the frequency of the occurrence of such crops in the rotations †. The experience and observation of the writer of the Agricultural Report of the North Riding of Yorkshire, however, incline him to the opinion that this kind of crop does not impair the fertility of the soil on which it is produced; as he has found the grain crops after the potatoes, and those of the grass seeds in succession to the grain, equal to such as succeeded crops of turnips ‡. The nature of the land to which his practice and observation were confined is not, however, mentioned.

On the whole, it may probably be concluded with safety that, notwithstanding the property which crops of this nature possess of mellowing and rendering the soil more loose and friable, they rob it of much fertility, and of course should not be often repeated, or have grain crops too frequently cultivated after them, without the ground being replenished either by an adequate proportion of manure, or by being laid down to the state of grass §.

It is also obvious from the circumstances that have been mentioned, that potatoe crops are only proper and advantageous as a preparation for wheat in the stiffer and more heavy sorts of land, on the lighter affording a state of soil more suitable for turnips, barley, and other crops that require the land to be loose and porous.

It has been ingeniously suggested, that much of that waste may be prevented which arises from the digging up of potatoe crops before they arrive at a state of perfect maturity, as is often done by small cultivators, by taking up such of the roots as present themselves near the surface with care by the hand, as in

\* Young's Annals of Agriculture, vols. XX. & XXIII.

† Ibid. vol. XXIII.

‡ Tuke's Corrected Report of the North Riding of Yorkshire.

§ Marshall's Rural Economy of Yorkshire.



that way the part of the crop that remains will be improved instead of being injured.

*Turnips.*—The introduction of this root into field culture has produced considerable alterations and improvements in the management of arable land, as well as in the feeding and maintaining of different kinds of live stock. It has contributed to lessen the necessity, and remove the loss sustained by the practice, of making naked fallows, and at the same time provided an abundant supply of food for the support and fattening of cattle, sheep, and other animals. In this combined view, it may of course be considered as forming the basis of the present improved husbandry on all the more light and friable loamy soils, where its cultivation can be successfully carried on upon an extensive scale; the nature of the plant and that of its culture retaining the land on which it is grown in a perfectly clean condition, and under a state of admirable preparation for various crops, but particularly such as require a fine, mellow, and well-pulverised bed of earth to grow in, as barley, grass-seeds, and many others.

The turnip has a roundish fleshy root, which differs greatly in form and colour according to the circumstances of soil, situation, and culture; but the varieties that have been principally cultivated in the field in different parts of the kingdom are those of the *round* and *long rooted* kinds.

The first sort, which varies greatly in colour both in the root and top, has commonly a round flattish root, and is distinguished by cultivators into the *round red* or *purple topped*, the *green topped*, the *white topped*, the *yellow*, the *black* or *red rooted*, the *stone*, and the *Dutch turnip*.

The second sort, instead of having a round shape, and spreading somewhat flatly on the ground, as in the above kind, has a longish cylindrical form, and is known to agricultors under the titles of the *tankard*, the *tap rooted*, and the *pudding* turnip.

All the varieties of the first kind, from their roots being formed more in the earth than those of the second, which often stand naked above the surface of the ground, are better adapted to the purpose of being cultivated in the field, where there is danger of their being exposed to the severity of frost; but in other cases, as for providing food at an early period for the support of suckling ewes, or the fattening of such sheep as are forward, the latter may be the most advantageous and proper, as they are said to be adopted with success in these intentions in the practice of Hertfordshire\*.

\* Bannister's Synopsis of Husbandry.



The cultivators in different districts prefer different varieties of the first sort; but where the situation is open and exposed, those that root deep or stand most in the ground should probably be chosen, especially where they are to be used in the winter season without being previously drawn and preserved, as experience has shewn that they are the most secure from the danger of frost. The green topped and white topped are generally esteemed more sweet and nutritious than the red topped, which possesses a degree of bitterness, and is apt soon to become stringy. The white topped, on the better kinds of soil, is perhaps the most proper and advantageous; as, while it has the property of being hardy, it grows to a large size. This and one of the stone or small hard sort are the most commonly cultivated, and held in the highest estimation in some of the best turnip districts in the northern parts of the kingdom. The latter is supposed by some Northumberland cultivators to stand the severity of the winter season much better than most of the other sorts; but that the produce on the acre is considerably less\*. And by others it is believed to bulb quicker, have a greater specific gravity, a finer grain, a thinner skin, and to be smoother in the crown of the bulb, consequently less liable to injury from wetness and severe frost. And that though it may not grow to quite so large a size, that defect may be obviated by leaving the plants a little thicker on the ground at the time of setting them out by the hoe†. The common white turnip is, however, much cultivated in this as well as most of the southern districts where the turnip husbandry prevails‡. The green topped turnips have been much recommended by others, both on account of the qualities just noticed, and their being of a large growth, and continuing long in a state fit for use||. The yellow or straw-coloured turnip is firm and sweet tasted, but has not yet been so much cultivated as the other varieties, so that its properties are not so perfectly known. The red sort was formerly much in esteem by farmers, but has now mostly given way to other sorts: and the black rooted is very rarely cultivated. The early Dutch is but seldom grown, except in the garden. Where an early crop is required it might, however, probably be employed with advantage.

The soils that are most adapted to the turnip husbandry are those of the light loamy or deep medium sandy kinds; but it may be practised on those of a thin, gravelly, or chalky nature, and even on loamy clays, in some cases when not too

\* Corrected Agricultural Report of Northumberland, p. 81.

† Corrected Agricultural Report of the North Riding of Yorkshire, p. 146.

‡ Donaldson's Modern Agriculture, vol. II.

|| Martyn's Edition of Millar's Dictionary, art. *Brassica Rapa*.



retentive of moisture, with advantage, provided proper attention be paid in the preparation and manuring of such lands. It is evident, indeed, from the successful culture of this useful root upon lands that differ greatly in their qualities, that it admits of more latitude in regard to soil than many other plants; though the opinion seems to have been too general among farmers, that it is only capable of being introduced with benefit on such as are of a very light and friable texture. This has probably had considerable influence in preventing the cultivation of the turnip root from becoming so general, as from its great utility and importance it ought to have been at this period.

But though the turnip may be grown to advantage on soils that vary in a considerable degree in respect to their natural friability and composition, it is constantly necessary to the healthy vegetation and success of the crop, that at least the more superficial parts of the land, or the bed in which the seed is to be deposited, be brought into as fine a state of reduction or pulverisation as possible; as more is found from experience to depend upon this being effectually performed, than even on the richness of the soil\*. This is useful in different ways: as, by its promoting the growth of the small seed weeds, they are capable of being more perfectly eradicated, and the young turnip plants of course less endangered by them; while, at the same time, a more fine and mellow bed is provided for the reception of the seed, and its vegetation rendered more quick and vigorous in consequence of the more equal diffusion of moisture that must thus take place. In order fully to effect these objects, it is the practice in those districts where the turnip husbandry is carried on in the most complete and successful manner, when the seed is put in on a fallow, to have recourse to four, and frequently five, ploughings, having the cloddy parts of the land well broken down in the intervals, by harrowing in different directions and the occasional use of the roller, as by these means almost every particle of the soil becomes exposed to the influence of the atmosphere, and is perfectly aerated and saturated with moisture. The first earth being given towards the close of the year in a shallow manner, so as merely to skim off the rough surface, it may then remain in this situation till about March, when it should be well reduced by harrowing, and cross-ploughed to the full depth. If weedy, it is to be again broken down by the harrow in the course of about a fortnight; but, when clean, it is better to remain in its rough state. It may then be left in this condition till about the middle of May, when it should have another ploughing to the full depth; and,

\* *Modern Agriculture*, vol. II.



when the season is dry, and the soil of the more stiff kind, immediately harrowed, but where it is light this may be deferred for a week or more. These repeated operations, when well performed, generally bring the land into a perfectly fine and clean condition; but if that be not the case, more must be had recourse to\*. Other cultivators, however, advise the first ploughing to be to the full depth, and that the after-ploughings and harrowings be continued to the middle of June†. These must, however, in general be regulated by the nature of the soil, the circumstances of the season, and the convenience of the agricultor. But when the seed is put in after grain, early peas, tare, or other similar crops, the preparation is seldom extended to so many ploughings. In some districts two ploughings and harrowings, the stubble and weeds being at each operation brought together and consumed on the land, are found sufficient with the seed earth‡. In others, where turnip crops are made to succeed clover or grass seeds, it is the practice to pasture the land in the spring with sheep to so late a period as only to admit of ploughing two or three times. And the sowing of this sort of crop on old pasture land upon one earth, is likewise stated as a successful practice on the experience of several years; the method of management in which is to plough the land pretty deep in winter, eating any grass that may arise from the edges of the flags close by sheep, and afterwards, before the seed is put in, reducing it well by harrowing||. These are not, however, modes of practice that are in general to be attempted, though they may succeed in particular instances. But in many cases, after the surface of coarse pasture and other old grass lands have been reduced by means of paring and burning, good crops of this root may be grown on one earth, or by once ploughing over the land, the ashes being previously spread on the surface in as equal a manner as possible. The ploughing in these cases should be performed to only a slight depth, in order that the crop may derive the fullest advantage from the action of the fire and the saline principles of the manure on the soil.

The principal aim of the agricultor in the culture of this root should constantly, however, be that of rendering the soil on which it is to be grown as fine and mellow as the nature of the land will admit; as without such cultivation his expectations must be frequently disappointed.

In regard to the application of manure for turnip crops, in the first methods

\* Kent's Hints, p. 110.

† Corrected Agricultural Report of the County of Suffolk.

‡ Corrected Agricultural Report of the County of Middlesex.

|| Corrected Agricultural Report of the North Riding of Yorkshire.



of preparing the land, and where it is of the calcareous kind, as lime, marl, or other similar substances, it may be the best practice to apply it after the second or third ploughings, in the first kind, in the proportion of from one and a half to about three chaldrons \*; and in that of the latter, from eight to ten or fifteen ordinary cart-loads, according to the circumstances and nature of the land; as in this way such matters may become the most perfectly blended and incorporated with the mold of the soil. Lime is successfully made use of for this crop in Yorkshire, and most other districts where it can be procured. And the use of marl has been attended with equal benefit in the county of Norfolk in England, and Angus in Scotland †. The former would seem to be the most proper on such sorts of land as are inclined to be in some measure stiff and adhesive.

When dung can be procured, the experience of different cultivators of the turnip, however, shew that it is the most suited to the growth of the root. For such soils as possess a sufficient degree of lightness, and are in a fine mellow condition, that which is become considerably reduced by fermentation, or in a more rotten and short state, may be the most proper, as it can be the most intimately incorporated with them; but where they have greater stiffness and cohesion, the longer kinds may be more beneficial, as they will not only tend to preserve such lands in a more open and porous situation, but, by their gradual decay in the earth, render them more mellow. Some, however, think it the most proper when it is neither in a very short nor very long state, but in a medium condition between such extremes ‡. Composts consisting of dung and different sorts of materials, as maiden earth, marl, and the mortary rubbish from old walls, in the proportions of one-fifth, well mixed, by having the dung laid over them in the winter, and afterwards blended together more intimately by turning before they are made use of, have also been employed with success ||. The dust of malt, or what is frequently termed combs, is likewise another substance that the same writer has recommended as an useful application in the way of manure in the culture of turnip crops. And the dung of rabbits, pigeons, and poultry, chopped rags, rape cake, river weeds, and other similar matters, may frequently be employed.

Dung, when employed as manure for this sort of crop, should vary in some measure in the manner of its application, according to the nature of the land and

\* Thirty-two bushels.

† Corrected Agricultural Report of the North Riding of Yorkshire; and Donaldson's Modern Agriculture, vol. II.

‡ Corrected Agricultural Report of Suffolk.

|| Kent's Hints, p. 112.



the mode in which the root is cultivated: in general, however, it ought to be deposited in the soil as nearly as possible to the period at which the seed is sown; as in this method, in consequence of the new fermentation that must take place in the soil, the crop may receive the greatest benefit from it. Where the seed is to be sown in the broadcast method, it may, therefore, be spread equally over the land, and turned in with the seed furrow; though some advise it to be lightly turned in by the ploughing that precedes the seed earth, and to be well incorporated with the soil by harrowing just before that earth is given\*. The former appears however to be the better practice when the dung is in a sufficiently reduced state, as the plants will have the more full advantage of it. The quantity that is necessary must depend upon the different circumstances of the soil and the richness of the dung; but less than ten or twelve good three-horse-cart loads can seldom be employed with advantage. If a compost manure be made use of, the proportion should probably be much larger. In Norfolk, according to Mr. Kent, they employ ten cart-loads; but in other districts twelve are made use of, and in others again it varies from six to ten; each containing about thirty bushels†.

Where the crop is sown in the drill manner, as it is confined to the middle of the ridges, and does not occupy the whole surface of the land, a somewhat less quantity may be sufficient. A liberal allowance should, however, always be made, as the safety and advantage of the crop depends much upon the rapidity and vigour with which the young plants are pushed forward by such means. When the lands have, however, been well manured for the preceding crop, the turnip crop may frequently be put in without the use of any manure.

In whatever method the dung is made use of, it should constantly be spread out evenly, and turned into the soil with as much expedition as possible; as where this is neglected much loss must be sustained by evaporation, especially when the season proves hot and droughty.

When malt-dust or combs is had recourse to, the quantity that is commonly applied is about twenty sacks, of three heaped bushels each, to the acre‡.

The dung of birds in its dry and reduced state, and other substances that have a powdery form, when used for this sort of crop, are mostly laid on in the proportion of from about twenty to thirty bushels to the acre§.

\* Kent's Hints, p. 112.

† Corrected Agricultural Reports of the Counties of Suffolk and Yorkshire.

‡ Kent's Hints,

§ Synopsis of Husbandry.



In applying such manures, as they require only to be put into the soil to a slight depth, harrowing in many cases may be sufficient for the purpose; which should be done just before the seed is sown, care being taken to have them first dispersed in an equal manner over the land.

Rape cake, when brought into a powdery form by mills \* constructed for the purpose, is stated to have been used in Norfolk by Mr. Styleman, an intelligent cultivator, with much success, in the proportion of a quarter of a ton to the acre †; the powder being placed over the seed in the drills by means of Mr. Cook's drill machine, merely by substituting proper cups and funnels. When river weeds, which have been tried with success in the same county by Mr. Coke and Mr. Branthwaite, are made use of, they are laid on the ground in their wet state immediately after being removed from the water, and as soon as possible turned in by a light furrow. This substance, from the danger of the vegetation of the seeds, can probably only be used with propriety on such soils as are of a very dry quality ‡.

There is still another method of providing and applying manure for this crop, practised in some districts ||; which is that of folding sheep on the land after the first ploughing of it up, until the seed earth is given. As the treading of the animals may often be apt to render the land so hard and compact as to be afterwards reduced to the proper state of pulverisation with difficulty, it may be the best practice in such cases only to use the fold in dry weather, always ploughing the ground lightly over as soon as possible after the sheep are removed.

*Quantity of Seed.*—It is difficult to ascertain the proportion of seed that may be requisite in different cases, as much must depend on the nature of the soil, the period of sowing, and the methods and circumstances under which it is put into the ground. In Norfolk, where this sort of husbandry is carried to a considerable extent in the broadcast method, it is generally from about one pound to a pound and a half; while on the sandy lands in Suffolk, and those of the lighter kind in Yorkshire, a pound or pint is found to be sufficient. But on the turnip soils in Middlesex nearly two pounds are employed. It is always,

\* The mills employed for this purpose, according to Mr. Kent's Report, are constituted each of two cylinders revolving towards each other: the first breaking the cake into pieces of the size of a walnut by means of cogged cylinders; while the other reduces it into powder by plain cylinders similar to those employed in reducing clay for the forming of bricks.

† The expence in 1796 was not more than 1l. 5s.

‡ Corrected Agricultural Reports of Suffolk.

|| Corrected Agricultural Reports of Norfolk and Hertfordshire.



however, a good practice in sowing turnips not to be too sparing in the use of seed, as the unnecessary plants may be easily thinned out at the time of first hoeing over the crop. The calcareous or chalky soils, in general, require the largest proportions of seed.

But in cultivating the root in the drill method, as the seed is delivered with more correctness, and the whole of the ground is not to be occupied by plants, some saving may be made in the quantity of seed made use of.

As much of the success of turnip crops is found from experience to depend on the quick vegetation of the seed, and the plants pushing expeditiously into broad leaf, it may be a practice of great utility in these views to have the seed steeped a few hours in water or some other liquid, before it is committed to the soil. When the season is dry, this will be particularly necessary. In the trials we have made in the garden practice, the steeped seed has constantly succeeded; while that which has been sown without immersion has frequently failed.

*Time and Methods of Sowing.*—The periods of putting crops of this nature into the ground must be principally regulated by the intentions of the cultivator in regard to the disposal of the produce. For the general more early consumption of the root, the most proper season for performing this operation may be about the beginning of June; but when it is intended that the crop should serve as food for animals in the early spring months, it is a better practice to delay the sowing till towards the beginning or middle of July. When the root is, however, cultivated upon an extensive scale, it may be advantageous to vary the times of putting the seed into the ground more considerably; as by such means the plants not only come more in succession to the hoe, but likewise for the purposes of consumption\*.

In some districts, as those where the practice of lamb-suckling is carried on, very early crops are occasionally required; in which cases the seed is generally put into the ground as early as possible in the month of May; such land as is in a fine state of tilth, and perfectly clean from weeds, being chosen for the purpose.

In general, however, the early-sown crops of turnips are not only less sweet and nutritious, but more exposed to injury from mildew and other causes, than those that are put in later; but, notwithstanding this, the sowing should not be deferred so long as that the plants cannot have time to cover and fix them-

\* Modern Agriculture, vol. II.; and Corrected Agricultural Report of the North Riding of Yorkshire.



selfes well in the soil before their growth is restrained by the coldness of the autumn and winter seasons.

There are different methods practised of putting this sort of crop into the soil in different districts: in most of the southern counties it is the more general practice to sow turnips in the broadcast manner on the level surface; while in the northern parts of the island, where this sort of husbandry has been considerably improved, it is the more usual method to employ the drill machine, depositing the seed in rows, either on ridges formed by one bout of the plough, or on the level surface; at the distances of from twenty-four to thirty inches in the ridge method, according to the circumstances of the soil and the intentions of the cultivator, and from ten to twelve or thirteen when on the plain surface.

It is probable that both these methods may be had recourse to with advantage under different circumstances of the land. On the very light, deep, sandy, or gravelly soils, that are apt to part with their moisture quickly, and of course become too dry and parched for the healthy growth of the turnip plant, it may be the most successful practice to put the seed in in the broadcast method on the level surface, as by such means the necessary proportion of moisture may be better preserved for the supply of the crop.

But where the soils are of a rather more heavy quality, and not so liable to part with their moisture, the ridged drill method, by the pulverisation which it affords, as well as its tendency to preserve the plants from being injured by the stagnation of too much moisture about their roots, may be the most proper and useful. And, besides being more beneficial in these ways, it possesses advantages in other respects; as on the thinner-stapled soils the turnip, on account of its long tap-root mostly requiring a depth of mold of ten or twelve inches, can seldom be grown in a perfect manner. The ridging up of the land may be of utility in providing a more suitable depth of cultivated soil, and better bed for the reception of the seed, the operation having been found to more than double the ordinary depth of mold of such grounds. It may likewise be added, that the manure, from its being merely confined to the ridges, is less exposed to the weather, and need not be employed in so large a proportion, consequently a greater extent of land be converted to the production of this crop; while, by its concentration, and the seed being placed immediately upon it, the nourishment and support of the crop may be more effectually promoted, and a larger produce afforded: and, for the purpose of early sowing, and being eaten off in the winter months, so late as January, it may also be preferable, as the turnips can



be more readily obtained for the cattle when there is a considerable depth of snow upon the ground \*. There are also other circumstances in this mode of cultivating turnip crops, that appear of importance: the hoeing and cleaning of the rows can be more easily performed, and in a more perfect manner, women or children being capable of being employed in the business; while the weeds in the intervals are capable of being eradicated, and the mold laid up to the plants by the plough. And it has been even suggested by some, that the danger of sheep, from being cast in the furrows, is considerably lessened if not wholly obviated; as on one-bout ridges they cannot lie down on their sides, or roll on their backs, as is frequently the case in the other methods †: though others think the contrary the case, and recommend constant attention while the sheep are feeding upon them ‡. From the narrowness of the furrows in such cases, the first conclusion would seem to be well founded.

The only objections to the raised drill method that appear to have much weight are, that from the root being more elevated and exposed, it is not so capable of standing the severity of the winter; and that larger spaces are allowed than are necessary for the roots to attain a sufficient size, consequently that the quantity of produce will not be so great. It would seem probable, however, that from the pasture of the plants being greatly enlarged, and the crops thereby rendered more healthy and vigorous, the amount of produce must be rather increased than lessened ||. It has also been contended, that in the raised method there is a difficulty of reducing the land to a level state again; and that the ground in the intervals becomes unproductive from not having the advantage of manure: it is obvious, however, that by making the ridges in a proper manner, according to the nature of the land, these inconveniences may easily be avoided.

\* Jobson in Communications to the Board of Agriculture, vol. II.

† Middleton's Corrected Agricultural Report of Middlesex.

‡ Tuke's Corrected Agricultural Report of the North Riding of Yorkshire.

|| It is observed by a cultivator in vol III. of the Farmer's Magazine, who has long paid great attention to the difference in turnips raised in drills with broad intervals and those produced in other modes, that they arrive at a much greater size in the former than in any other method which he has seen. In judging of the weight of such crops by the acre, it is the opinion of many, that the largeness of the turnips is not to be so much attended to as the greatness of their number. This he suspects may have led to erroneous conclusions. But taking the intervals in the narrow method at about thirteen inches, and the distance of the plants in the rows at about twelve, an acre will contain about 40,200 turnips: and in the raised drill method, at the width of twenty-seven inches in the intervals, and the distance of about eleven in the rows, the same space of land will contain about 21,100. And that in



On dry level grounds it is advised in this view to have the drills in a diagonal direction over the field; and where the ridges are high, directly across them, the plough being drawn down the furrows to discharge the water.

It has likewise been adduced as an additional inconvenience in the raised drill method, that where the lands are of the more wet and heavy kinds, and have but little declination of surface, though larger crops of turnips may be produced, the grounds are so much injured by being poughed in conveying them off, that the grain crops which follow will be diminished in a larger proportion than can be compensated by the extra value of the turnips. In such cases it is, therefore, recommended as more advantageous to form the land into ridges, sufficiently rounded to convey the water with facility into the furrows, and of such breadths, as about fifteen feet, that a cart can be easily conducted along them without pressing the earth in and obstructing these furrows; the seed, where the land is disposed to the throwing up of annual weeds, being put in drills on their surfaces, as by that means the business of hoeing may be rendered more easy: but where this is not the case, and where the sowing is performed at a late period, or the land is infested with the grub, the broadcast method may be preferable, as being more certain from the circumstance of the plants being left so near to each other at the first hoeings as to admit of thinning and the removing of such as are weak and unhealthy at the succeeding operations. Besides, they are supposed to have the advantage of growing more

respect to the *real* size of the turnips, he has no doubt of being supported by the generality of the most experienced cultivators in maintaining, that when the various circumstances of *soil, climate, ploughing, manuring, seed, time of sowing, &c.* are equal, that where those in the drills with narrow intervals grow to six inches diameter, those in the drills with broad intervals will grow to eight and a half inches *upon an average*. Now, says he, as similar solids are in a triplicate *ratio*, the weights of the turnips will be as the cubes of their diameters, or as 216 is to 614; as *experiments in weighing will prove* where the turnips are spherical, which is mostly the case in the best kinds. Hence the weight of the 40,200 to that of the 21,100, is as 86 to 129 nearly; and, consequently, when the latter are worth 6*l.* the acre, the former will only be worth 4*l.* 5*s.* As it may be objected that he has taken the turnips in the former mode *smaller* and in the latter *larger* than they *really* are, it is added, that, even supposing the latter had been taken at considerably less than eight inches diameter, the 21,100 would have outweighed the 40,200 by about one-eighth part, which is, he says, equal to fifteen shillings the acre. He is perfectly convinced, however, that the results of properly conducted experiments will shew that he is right in taking the proportions upon which he first calculated.

The conclusion, therefore, is, he thinks, that, besides the saving of expence, and the other important advantages that have been mentioned, the method of cultivating turnips by the drill with wide intervals produces a weight of turnips on the acre greater by about one-third than where the narrow-spaced drill plan is followed.



vigorously from their sheltering each other more fully, as well as from the ground being less stirred about them in the early period of their growth, before their tap roots are sufficiently fixed to support them\*.

It would seem, however, from the success that has attended the putting in of this sort of crop by the drill in different districts, and the greater ease and cheapness with which the after-culture of the crop can be performed, that it is in general the most advantageous method; but that at the same time it may often be necessary to vary the nature of the ridges and the distance of the rows according to the quality and circumstances of the soil†.

\* Jobson, in Communications to the Board of Agriculture, vol. II.

† The following are the results of an experiment on the weights of six different parcels of turnips taken from a field of fifteen acres, which had been sown in June, 1797, with the view of determining the comparative value of the drill and broadcast methods. The whole being in a state of equal tilth, and manured in as equal a manner as possible, immediately before the seed was sown, with well-rotted fold-yard dung, in the proportion of about seventeen cart-loads to the acre, each containing twenty-eight Winchester bushels; and with the view of rendering the trial as fair and accurate as possible, different breadths of land, of twenty yards each, were sown in the drill and broadcast methods alternately throughout the whole: part of the drills being on *one-bout* ridges of twenty-seven inches each, and the dung deposited immediately underneath the rows of seed; and the remainder in drills on the level surfaces at twenty-one inches distance. The produce per acre being calculated on the weight of four square perches, or the fortieth part of a statute acre, of each; the tails or fibrous parts of the roots being first cut off and rejected, taking the weights of the tops and roots afterwards separately.

It is added, that though the crop, especially on the drilled part of the field, was not a very good one, being too much thinned and otherwise injured by the *grub* after the plants had been finally set out, it was found that the turnips on the *one-bout* ridges exceeded the others in weight; the whole being taken from an inferior part of the field, in order to afford a fairer average.

|        | Times of weighing.                                                          | Number upon four square perches. | Weight on four square perches, or the fortieth part of an acre. |                      |                      |  | Weight per statute acre. |  |                    |  | Average weight of each turnip. | Average distance of each turnip. |
|--------|-----------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------|----------------------|----------------------|--|--------------------------|--|--------------------|--|--------------------------------|----------------------------------|
|        |                                                                             |                                  | Roots.                                                          |                      | Tops.                |  |                          |  |                    |  |                                |                                  |
| No. 1. | Drilled on one-bout ridges, at 27 inches distance                           |                                  | cwt. qr. lb.                                                    |                      | cwt. qr. lb.         |  | tons. cwt. qr. lb.       |  | lb. oz.            |  |                                |                                  |
|        | January                                                                     | 354                              | 8                                                               | 1 1                  | 1 1 3                |  | 19 1 0 20                |  | 3 0 $\frac{1}{4}$  |  | 16 $\frac{1}{2}$ in. by 27     |                                  |
| 2.     | Drilled with Mr. Bailey's machine on a level surface, at 21 inches distance | Ditto                            | 428                                                             | 7 1 15 $\frac{1}{4}$ | 1 1 5 $\frac{1}{4}$  |  | 17 7 1 8                 |  | 2 4 $\frac{1}{4}$  |  | 17 in. by 21                   |                                  |
| 3.     | Broadcast - - -                                                             | Ditto                            | 568                                                             | 7 2 12 $\frac{1}{2}$ | 1 0 11 $\frac{1}{4}$ |  | 17 8 1 26                |  | 1 11 $\frac{1}{2}$ |  | 16 $\frac{1}{2}$ each way      |                                  |
| 4.     | Drilled on one-bout ridges, at 27 inches distance                           | March 2                          | 334                                                             | 8 3 0                | 1 1 22               |  | 20 7 3 12                |  | 3 6 $\frac{1}{2}$  |  | 17 by 27                       |                                  |
| 5.     | Broadcast (these and the preceding were round white turnips)                | Ditto                            | 628                                                             | 8 2 22               | 1 1 8                |  | 20 0 2 24                |  | 1 12 $\frac{1}{2}$ |  | 16 each way                    |                                  |
| 6.     | Broadcast (red) - - -                                                       | Ditto                            | 561                                                             | 6 3 26 $\frac{1}{2}$ | 2 3 5                |  | 19 11 1 0                |  | 1 15 $\frac{3}{4}$ |  | 16 $\frac{1}{2}$ ditto         |                                  |

It



In cases where the broadcast method of sowing turnip seed is practised, it is of considerable importance that the surface of the land be rendered as fine and even as possible before the sowing is performed, and that the seed be delivered or dispersed over it in a perfectly equal manner, and as soon as possible after it has been ploughed up; as upon these operations and circumstances being properly conducted and attended to, the success of the crop in a great measure depends. The latter can seldom be executed by the hand in a proper manner by persons who have not been in the habit of sowing the smaller kinds of seeds: but a sort of box, or machine constructed for the purpose, is often made use of by those who have not been much accustomed to the business; and, when proper care is taken to see that the perforations do not become obstructed by two or more seeds being fastened in them, may be extremely advantageous in delivering the seed in an uniform and regular manner.

The seed, after it has been distributed over the surface in some of these methods, is mostly covered by means of harrowing; a light short-tined harrow being the most adapted to the purpose, as, from the turnip plant forming its bulb in a great measure above the ground, it should probably not be put in to too great a depth. It has been advised in performing this operation to pass the harrows over the land only twice in the same direction, walking the horses in the first, and trotting them gently in the last, in order to give a neater finish; the ridges having been laid out to the breadths of from four to ten yards, according as the soil may incline to moisture or dryness\*.

In the drill method of putting in the crop, the land, after being prepared in the manner that has been directed above, is either formed into ridges by the plough, or the drills are stuck in the level surface, as has been already noticed.

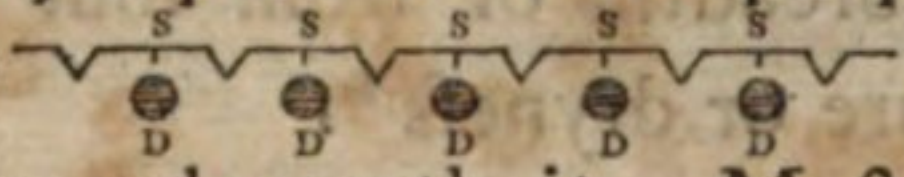
The manner of performing the first operation is by a furrow being first drawn as straight as possible down the field, and in returning another furrow from the other side being laid up against it, by keeping the off-side horse in the first made furrow; a suitable proportion of land being given to the plough for forming a ridge of proper height, somewhat in this way  $\Lambda$ . The work is then to be

It is observed, that by noting the average distance of each turnip in the last column, it is intended to shew at one view how many plants there were wanting in the drills to have made them a full crop; for if 550 be stated as a medium number in a full crop upon the fortieth-part of an acre, they will be found to occupy a space of 17 inches each way in broadcast,  $10\frac{1}{2}$  by 27 inches on the one-bout ridges, and of  $13\frac{1}{2}$  by 21 inches in those drilled on the level surface; whence it may be easily seen how much those were wider in the rows than they ought to have been.

\* Kent's Hints, p. 112.



continued in a similar method throughout the whole field, which when finally accomplished will have the appearance of alternate ridge and furrow, somewhat in this manner  $\Lambda\Lambda\Lambda\Lambda\Lambda\Lambda\Lambda$ . A distance, as has been observed above, of from about twenty-seven to thirty inches is preserved between the ridglets, in order to admit of the plough passing between them in the after-culture of the crop, but which in less distances cannot be the case.

After the business has proceeded in this way, the manure is to be placed in the drills: which is the most conveniently effected by employing small carts, and having them to proceed along either every third or every fifth furrow, depositing it in small heaps in them; proper persons with small three-pronged forks being stationed so as to follow and place it in an even and regular manner in the bottoms of the three or five furrows, or those in which the manure is dropped from the carts and those on each side of them. After this has been accomplished, the small ridges before thrown up are split down, the earth from each covering the manure up in the middle, so as to form new ridges in the same manner as before. The tops of these ridges are then to be flattened by some means or other: the most common is a small light roller, that passes along two of them at once. The turnip seed is then put in exactly in the middle of the flattened parts of the ridges, by means of a drill contrived for the purpose, and which is frequently fastened to the flattening roller by a rope six or seven feet in length, and directed behind by a person for the purpose. The business, when finished, appearing in this way ; S representing the seed, and D the manure immediately underneath it. Most of the drill barrows are implements that may be attached to the ploughs in the same manner. The rollers and drills are mostly drawn by a single horse, driven by a boy; but the person that regulates the latter may also direct the horse, when it is properly trained and accustomed to the work\*. Sometimes, instead of the roller, a kind of sled, made of wood or iron, is employed for flattening the surface of the one-bout ridges; but a light roller seems to be the neatest and most convenient implement.

The operations of forming the ridglets and inclosing the manure in them, are generally, in the northern districts, performed by a common light swing-plough; but they may probably be accomplished with greater expedition and regularity by a light double-mold-boarded plough.

\* Corrected Agricultural Report of Northumberland.



For the purpose of putting in the seed, drill machines of both the barrow and other kinds are employed; but those that are attached to the plough or roller, and of course perform the different operations of ploughing and sowing at the same time, are, perhaps, in general to be recommended. Great attention is, however, constantly necessary, to see that the seed be regularly dispersed and deposited in the soil; as, from the smallness of the perforations in the revolving cylinders of most of such machines, the seeds are liable to be obstructed, and the regularity of the sowing thereby prevented.

But where the drills are formed upon the level surface without being raised, which is the practice in some districts, and especially when made at narrow distances, as twelve or thirteen inches, the larger sort of drill machines, which sow a number of rows at a time, may be had recourse to with advantage, as being more expeditious\*.

In whatever manner the turnip seed may be put into the ground, experience has shewn it to be of much importance to have it deposited in the soil in such a way, and under such circumstances, as that its germination and early growth may be as expeditious as possible, as upon this the success of the crop in a great measure probably depends.

It has been maintained by some, that the seed, in order to secure these effects in the most certain manner, should be placed in the soil to the depth of three or more inches: and they have contended, that the superiority of the drill method partly arises from the seed being deposited to a greater depth, and growing more rapidly in consequence of having more moisture, so as to become sooner out of danger from the fly or other insects†; while others, from the circumstances that have been noticed above, think that it should be covered only in a light manner‡.

As it has been already shewn that air is necessary as well as moisture to the vegetation of seeds when placed in the ground, it would seem probable that the quick vegetation of such crops may be the most effectually secured by only putting them in to a middling depth, and according to the particular nature of the land and state of the season, as from an inch and a half to two or more inches, as the soil or season may be inclined to be dry or the contrary. In this way, the inconveniences arising from the seed being too much exsiccated by its exposure near the surface, and from the want of the action of the air on account

\* Section on Implements.

† Exter, in Transactions of Society of Arts, vol. XVI. p. 191.

‡ Corrected Report of the North Riding of Yorkshire. Note.



of its too great depth, may be equally obviated. But as crops of this sort are mostly put into the earth during the hotter months, there is another circumstance that may be of equal consequence in promoting the quick growth of the young plants; which is, that the seed, especially in dry hot seasons, be in a great measure saturated with moisture, and of course with the oxygenous principle of the air, before it is committed to the ground; as by such means these will not require to be drawn from the surrounding mold, but the process of vegetation almost immediately commence. In the culture of this root in the garden, by adopting such methods, we have not, even where the seed was sown in the hottest seasons, failed having good crops; as the plants, from the quickness of their growth, are but little exposed to the attacks of the fly, it being chiefly such only as from their weak and imperfect growth become sweet and tender that are devoured by this destructive insect\*.

\* It is observed by the Rev. H. B. Stacey, in an useful pamphlet on the failure of turnip crops, that the first process towards vegetation in this seed is its swelling, by having imbibed a certain quantity of moisture: it is then able to exert its vital powers; and, in order to secure its future increase, when the demand for nourishment is in proportion to its growth, it sends forth its radicle or little root, which as it lengthens begins to branch out, being covered with very fine hairs resembling down; which, by sowing a single seed close to the inside of a glass vessel filled with moist earth, may be easily observed. And that when the radicle has proceeded about half an inch, it sends forth its germ, consisting of the stem and seed-leaves, with the bud of the future plant in embryo. These seed-leaves are supposed to contain proper nourishment for the plant during the first stage of its growth; the radicle being then too small and weak to furnish food sufficiently delicate. That every injury, therefore, done to these leaves, either from being punctured by insects or deprived of a supply of moisture, must assist in checking the growth of the plant. And further, after suspecting heat and dryness to be the principal causes, that where the seed is sown in such seasons there is scarcely sufficient moisture to cause it to sprout; and that unless it be deposited to such a depth as that it may be screened from the action of the sun, its vegetative powers may be destroyed. But though a great part of it may imbibe sufficient moisture from the dews and dampness of the surrounding earth during the night season to render it capable of vegetating, its progress must be retarded by the heat of the succeeding days; and by being thus alternately moistened and dried, its vital principle be much impaired, if not entirely destroyed. And even if, as is sometimes the case, the seed finds moisture sufficient to enable it to produce both its radicle and germ, and even to raise its seed-leaves above the surface of the ground, still the same destructive effects may be ultimately produced; the heat then exerting its influence on the external parts of the plant, by evaporating its moisture faster than it is supplied by the radicle, by which it either withers away, or is so much injured that it never completely recovers itself; and that there is no doubt but that many acres of turnips are annually spoiled in this way.

In proof of the above, though it is admitted that turnip crops may be materially injured by the ravages of insects, the following experiments were made:

In



The general success of agricultors in raising these crops, by putting the seed in immediately after the plough, while the soil is in a moist condition, not only proves the correctness of these principles, but shews that great utility may be derived from steeping the seed in some watery liquid before it is committed to the ground whenever the season is hot, and the surface of the land in a very dry and parched state; as by such a practice good crops of turnips may frequently be produced, where they would otherwise almost wholly fail. The preservation of the turnip crops in China have, indeed, lately been chiefly ascribed to this practice\*. And in farther confirmation of the practice, it has been contended, that when the seed is sown in the time of rain, or when it quickly succeeds the sowing, the plants grow so rapidly as to receive no injury. On the same principle, as has been already noticed, it has also been maintained, that, by putting the seed in deeper than in the ordinary broadcast method, as by depositing it in drills, a more certain crop is produced, from the circumstance of the plants proceeding in their growth with greater rapidity†. As it has, however, been shewn that the atmospheric air has much effect in promoting the quick vegetation of most sorts of seeds when put into the ground, care should be taken, as has been shewn above, not to place them at such a depth as that it may be prevented from affording its most beneficial influence.

*After-Culture.*—On this part of turnip husbandry being performed in an effectual manner, and at such periods as are the most suitable for promoting the

In hot dry weather, in the year 1793, some turnip seed was sown in shallow drills, drawn by a hoe, on a light poor soil; and notwithstanding the fly was accused of having destroyed many crops in the adjoining grounds, the seed came up and produced a good crop. And in 1794 the same experiment was repeated with similar success, although the fly was more general than in the former year.

But in order to ascertain whether any advantage would be derived by sowing the seed deeper, under an idea that the germ would require more time to force its way to the surface, and the radicle at the same time be increasing its power downwards, and consequently be more capable of withstanding the sun's heat, thirty-two turnip seeds were sown at different depths, in glass vessels filled with common garden mold, and plunged into the earth; on the fourth day after sowing they were examined, and the results were as follow:

The seed sown at 4 in. depth, had shot forth a radicle, 3 in. long, a germ 1 in.

|         |       |          |         |                  |
|---------|-------|----------|---------|------------------|
| 3 ditto | ditto | 2½ ditto | ditto ¾ | } on an average. |
| 2 ditto | ditto | 2 ditto  | ditto ¾ |                  |
| 1 ditto | ditto | 1½ ditto | ditto ½ |                  |

\* Sir George Staunton's Embassy to China, vol. III. p. 310, 8vo. edit.; and Gillet in Bath Papers, vol. II.

† Exter, in Transactions of the Society of Arts, vol. XVI.; and Stacey's Observations, p. 20.



growth of the young turnip plants and preventing those of the weed kind from injuring them by the obstruction and shade which they produce, much of the success of the crops must in general depend; as, without considerable attention in this respect, the labour and expence that have been employed in preparing the soil and putting in the crops must in a great measure be thrown away, the produce being seldom sufficient to repay the cultivator in an adequate manner. This culture is to be accomplished by means of the hoe. Where the crop has been put into the ground in the broadcast method, the hand-hoe only can be employed; but where the seed is sown in rows by the drill, and a sufficient space of interval allowed, those of the horse kind can be made use of, either alone, or in addition after the plants have been properly thinned out in the hand method. It is usual when the plants have produced four or five leaves, or when they cover a circle of from three to four inches in diameter, which, in kindly seasons, will mostly happen in about a month or six weeks from the time of sowing, to begin these operations. In the first of which, such plants as stand too close must be thinned out to a suitable distance, according to the circumstances of the season, the nature of the soil, the period of sowing, and the use to which the crop is to be applied. When the season is hot and dry, the thinning in the first hoeings should not be to too great a distance; as by keeping the plants pretty close together the moisture of the land may be better preserved, and the crop rendered more secure: but in rich soils, when early sown, and when intended to be consumed by cattle at an early period, more thinning may at first be advantageous. The most usual custom is to leave the plants in the first hoeings at the distance of from six to eight inches from each other; and some cultivators prefer a still greater distance\*. In the second hoeing, which should be performed in the course of about a fortnight or three weeks from the first, according as there may be necessity, the plants that are to remain for a crop may be left at the distance of from ten to twelve or fourteen inches in the broadcast practice; and at those of from nine to fifteen, or sometimes more, in the rows where the drill system is employed.

In the second hoeings, the mold between the plants should always be well stirred, in order that it may be perfectly aerated, and any weeds that may have risen be effectually destroyed. The future hoeings of crops of this kind must be regulated by the particular circumstances of the cases; but the mold should never be allowed to become too compact about the roots of the plants, or weeds suffered to interfere with the crops.

\* Kent's Hints.



In the county of Northumberland, where the turnip culture is performed in a very perfect manner, it is the general practice in the drilled crops, as they have so much room laterally, to leave them at not more than eight or nine inches apart in the rows. In performing the operation, the labourers proceed sideways, pulling the surplus plants and weeds into the hollow intervals between the one-bout ridges, the plants being left perfectly regular in the rows. The work is accomplished with much ease and facility by women or children.

After this, when the turnip plants become perfectly established again in the soil, which is mostly the case in about eight or ten days, the earth is taken from the rows where the turnip plants stand, by a light plough contrived for the purpose, and turned upon the plants and weeds left by the hand-hoes in the intervals of the ridges. And when they have recovered themselves from this operation, and are become again in a vigorous condition, or when other circumstances render it necessary, the mold, which was in the former process turned from the turnip rows, is now divided and laid up equally to the different rows by the same implement, or a similar one with a double mold-board. In this way, where the land is clean and free from weeds, the business is completed; but when the contrary is the case, additional hoeings and ploughings must be given according to the state of the land\*.

With some cultivators it is a practice to pass a light harrow over the land once in a place, as soon as the plants are sufficiently strong, in order to render the first hoeing more effectual; and even in particular cases, where they push forward rapidly, it is made use of a second time in the contrary direction†. In performing this business, great care is, however, necessary, especially where the plants are thin upon the ground; otherwise too many of them may be dragged up and destroyed.

It has been observed, that, by having the seed put into the ground at different periods, great advantage may be obtained in the hoeing of the crops; it having been found that, by adopting such a practice, six labourers are capable of accomplishing the work twice over one hundred acres or more, while in the contrary case a much larger number will be required‡.

It is obvious that the hand-method of hoeing turnip crops, which is the only method that can be employed where the broadcast plan of sowing is pursued, is not only much more troublesome and expensive, but more confined and less

\* Corrected Agricultural Report of the County of Northumberland.

† Corrected Agricultural Report of the County of Suffolk.

‡ Ibid.



beneficial in its effects than that by means of the horse-hoe or plough. In the former mode the expence of the two hand-hoeings are generally from six to eight or nine shillings the acre; while in the latter it rarely amounts to more than four or five. Besides, by the use of the horse-hoe or plough in the intervals, the crops are not only kept more clean, but a more continued and more abundant supply of nourishment provided for the growth of the plants, on account of the repeated full aeration of the mold that must take place.

In performing the turnip culture in this way, many different implements have been recommended by different cultivators; but it would seem that the operation may be accomplished with sufficient exactness by any small light plough. In many districts, the hoe-plough is employed in this business with success. The Northumberland farmers chiefly make use of a small light plough, about five inches in width at the bottom behind and eleven at the top, which is drawn by a single horse, for the purpose of ploughing the intervals between the rows, which is found to answer extremely well: but doctor Anderson contends that the work may be performed in the most perfect manner by the common light swing-plough. In earthing up the rows, the double-mold-boarded plough may, however, be probably more expeditious and convenient. Improved double ploughs of this sort have been contrived for the purpose of cleaning turnip crops, and are said to be employed with considerable success and advantage; as by their capability of being readily set to different distances, so as to suit the different widths of the rows, they not only perform the business of removing or paring off the earth from both sides of the rows at the same time, but by being brought close together effect the operation of earthing up the plants. In conducting the process with this implement, there is obviously not only an advantage in double the quantity of work being performed, but the operations are accomplished with more correctness, both in respect to the stirring of the earth in the intervals of the drills and the application of the mold to the stems of the young plants\*.

Others, however, contend that these advantages may be equally attained by performing the business in a particular method by means of a single-mold-boarded paring-plough, drawn by one horse, while the danger and inconvenience of being obstructed by stones or other matters is lessened or wholly removed. This is that of paring only one side of the ridge at a time, leaving the other to be performed some days afterwards. After the turnip plants have

\* *Farmer's Magazine*, vol. I. p. 413.



been properly set out, the work is said to be begun and conducted in this manner: the ridges of the field lying in the direction of east and west, the operation is begun from the east end of them and the north side of the field; the ploughman counting off to his right hand, on that side, a certain number of ridges, as for instance six, enters upon the seventh, and, proceeding west, pares a furrow-slice from the north side of it, and turning to the left, in returning does the same to the south side of it\*. Continuing in this way to go west, the same operation is performed on the north sides of each of the six ridges that lie to the north of that from which he set out; and in returning east, on the south sides of the same number of ridges which lie to the south of it. After having completed in this manner one *pitch* of work, consisting of thirteen ridges, he is to begin again in a similar manner, and proceed in the same way till the whole of the field is gone over. After the weeds turned in by this first operation are supposed to be perfectly decayed, the same work is performed in the contrary direction on the other sides of the ridges, or those left in the other operation, over the whole field†. This method of hoeing or cleaning turnip crops, which appears to have been practised with much success on a light sandy soil, free from stones, by Mr. James M'Dougal, a farmer at Linton in Scotland, is, it is observed, carried on as long as the stems of the turnip plants will admit the plough to pass. In this mode the plants are never earthed or set up, it being the opinion of the above cultivator that they thrive better without that operation. And, besides that, in feeding them off with sheep, they get better at them, and have a more easy footing, as well as more comfortable lying.

In accomplishing these operations, it is observed that great care is necessary to keep the plough as near as possible to the plants on the ridges, as by that means different advantages are attained, such as the greatest possible proportion of weeds being removed from the plants standing on the pared ridges; the largeness of the furrow slices thus raised being sufficient to cover up all the weeds that grow in the intervals, between the drills of turnips on the pared ridges and those upon which the furrow slices are turned. Besides, the moisture may be better preserved in drouthy seasons for the growth of the crop, and the soil more perfectly aerated, in consequence of being more frequently stirred. It is obvious also, from one side of the ridge only being pared at a time, and the

\* This ridge is sometimes provincially denominated the *fairing ridge*.

† Farmer's Magazine, vol. II. p. 50.



other left firm and unpared, that the plough may be capable of being brought nearer to the turnips without the risk of loosening them too much, or turning over the earth on which they stand, than could be the case if both sides were pared at the same operation\*.

In whatever way the operation may be performed, or whatever plough or hoe may be made use of, it must be of the greatest advantage to have the mold well loosened near to the plants, especially on the heavier descriptions of turnip soils; and in these, as well as those of the more light kinds, the turnip plants should never be suffered to be annoyed or incumbered by any sort of weeds growing near them.

Turnip crops are exposed to danger from different causes during the early stages of the growth of the plants; but the chief are the attacks of the fly †, the slug, and the black caterpillar. The first chiefly prey upon the tender saccharine seed-leaves of the young plants, and its presence is rendered sufficiently evident by its leaving many little brown spots on them, and by eating away their fleshy green parts down to the fibres. They are said to increase both in number and size until the plants are consumed. The ravages of the slug may be easily traced, by observing the edges of the leaves; as it is upon them it first begins to feed, gradually proceeding from one part to another till each of them is more or less consumed, and the whole of the plants in many cases destroyed. It has been well remarked, that a field of young turnips, when attacked in this way, exhibits some of the leaves as having lost a quarter, others one-half, some three-fourths, and others the whole, the stems only remaining ‡; and in some instances these are also attacked.

The depredations of the black caterpillar principally take place after the crops are in a more advanced state of growth, and the plants have formed considerable tops, and are in what is usually termed *rough leaf*; the green parts of the leaves being eaten through and destroyed, and of course the growth of the plants prevented.

Various means of preventing the young turnip plants from being destroyed by animals of these kinds have been suggested at different times; but hitherto

\* Farmer's Magazine, vol. II. p. 56.

† This highly mischievous insect, according to Linnaeus, belongs to the Genus *Coleoptera*, and is described under the titles of *Cryfomela oleracea* and *Cryfomela nemorum*; the former being of a dark-blue colour tinged with green, and the latter black striped with yellow on the different shells, and something larger than the other.

‡ Corrected Agricultural Report of Middlesex, p. 210.



probably without any of them being fully effectual. It would seem, however, from what has been already advanced, that their safety and preservation depends much both on the land being so enriched by manure, and in such a condition in respect to moisture, as that the germination of the seed and after-growth of the plants may be such as to render them quickly in the state of *rough leaf*. This, as has been seen, may likewise be further promoted, especially in hot and dry seasons, by steeping the seed in some watery or other liquid before depositing it in the soil. In these as well as other views it has been recommended to make use of new seed and such as is one year old together, as in this way the crops, by coming up at different times, may be less in danger of being wholly destroyed; or, what is probably a better practice, to steep one-half the seed, after being thus mixed, in water for twenty-four hours, and then blend the other half with it, sowing the whole in the usual manner. In this management the plants, by rising at many different periods, may have a greater chance of escaping in sufficient quantity for the purpose of a crop \*. This method is indeed particularly enforced by the observation, that the insects frequently make their attacks suddenly in large numbers, destroying the plants as fast as they rise, and as suddenly disappear, leaving such as come up a few days afterwards untouched. The success that has attended the steeping of turnip seed in the juices of different kinds of vegetables, and also in train-oil, linseed-oil, or other oleaceous liquids, as has been advised by different cultivators, seems to depend on the same principle, and affords an additional proof of the advantages that may be derived in this way †. Where such oily substances are employed, it is usual to let the seed remain in them twenty-four hours or more; and, after it has been taken out, to drain them well from it by means of a fine sieve, linen bag, or other contrivance; then mix with it finely-sifted earth or sand, depositing it in the soil as quickly afterwards as possible. In this method the same oil may serve different times.

On the supposition that some other sorts of plants are more agreeable, and consequently more subject to be fed upon by this devouring insect than the turnip, the practice of sowing other sorts of seed with that of the turnip has been lately revived and recommended ‡. In this intention it has been advised to mix and sow radish seed with that of the turnip, in the proportion of about

\* Modern Agriculture, vol. II.

† Annals of Agriculture, vol. VI. pp. 90, 156, and vol. IX. p. 389; and Transactions of the Society of Arts, vol. V. p. 38.

‡ Transactions of the Society of Arts, &c. and Commercial and Agricultural Magazine, vol. VII.



two pounds to the acre. It is evident, however, that this plan must be extremely uncertain, as it cannot be successful except where the two kinds of plants rise exactly at the same time, which, from the great difference in the vegetative powers of the two seeds, will probably seldom be the case. If any advantage is to be gained in this way, it must be by employing a plant which is preferred to that of the turnip, and the seed of which is somewhat quicker in its germination and growth; as, where this is not the case, the turnips may frequently be destroyed before the other plants be in a state to be fed upon\*. It has been suggested that the *tuta бага*, or Swedish turnip, may be a more useful substitute in this view than the radish; as, by its being steeped and the turnip seed sown dry, the plants would rise well together, and the fly is well known to be so eager in feeding upon it, that it is with difficulty the cultivator can preserve a sufficient plant. In this case it is hinted as a further advantage, that when both sorts of plants remain without sustaining any material injury, the farmer may have the option of cutting out either of them, as he may find the most convenient and beneficial†.

\* Commercial and Agricultural Magazine, vol. VII. p. 90.

† It is doubtful whether the radish plants are always preferred by this insect or not; as we have often remarked in the garden, that where turnip and radish crops were cultivated adjoining each other, the leaves of the former were equally devoured with those of the latter. Mr. Marshall, in the second volume of the Rural Economy of the Midland Counties, after remarking that the insect is not a *fly*, but a *beetle* of the latter of the kinds described above, gives the following very accurate description of it: The whole length of the body and head is, says he, from one-twelfth to one-tenth of an inch, and its width or breadth about half its length. The *antennae* consist of two points, and are about two-thirds of the length of the body. The wing-cases are concave, and join by two straight edges, having the colour of dark chocolate, with a stripe of yellow white along the middle; occupying about one-third of the surface, which is dimpled, polished, and shell-like, both sides the same, the texture being brittle as egg-shell. The wings are folded back under the cases, being membranous and nearly twice their length, having two or three strong nerves running about half their length. Their colour a light brown or that of stone, but that of the nerves a dark brown. The legs six, and black; the two hind ones clubbed upwards. The head and breast black and polished. The abdomen the same, having four articulations.

In taking this insect for the purpose of examination, the author discovered that he had bruised a number of soft insects on the under-sides of the seedling leaves, which led him to examine them more carefully, and to find that they were *paved* over with minute animals of the *appis* kind, having different colours, as yellow, green, black, and two or three long-winged flies. On still more minutely examining them, he found that both the animalcules and the flies were individuals of the same insect in different states.

He gives the following description of the flies:—The body and head are black, short, nearly egg-shaped, and about one-twentieth of an inch long, being somewhat larger than a grain of mustard.



Remedies of this nature are probably, however, much less to be depended upon than those that have been mentioned above.

As the effects of the slug, which is an animal of the white snail kind, on turnip crops, are often equally, if not more, destructive than those of the fly, from its attacking them at a later period, and consuming not only the leaves, but the more solid parts of the plants, it is necessary for the cultivator to guard against them also as much as possible. In this intention various means have been proposed, but probably without any of them being completely successful: from its having been remarked, that these slugs chiefly quit terrestrial habitations during the night-time, or early in the morning before the sun rises, when the surface of the soil is moist from the dews, it has been advised, by the older as well as the more modern writers on agriculture, to have recourse to rolling in the night with a roller of considerable weight, in order to crush and destroy them before the light or heat of the day induces them to retire into the soil\*. The second of these writers seems indeed to believe that the practice may be useful against the fly, where these insects exist in great numbers, and the operation is performed while the surface is wet, by licking them up with the clammy earth, and in that way wholly removing them. It may also be beneficial against such insects, by confining the moisture more effectually in the soil, or by preventing the germs of the young turnip plants from appearing before their roots are fully established in the earth.

The dispersing of different substances, such as vegetable ashes, lime, and soot, feed. The wings four: two very long, standing high above the tail, more than twice the length of the body; two very short, not so long as the body; but both pairs transparent, and strengthened by a few opaque straight nerves. The *shade* coppery and elegant. The *antennæ* long, slender, and tapering, but the joints indistinct; the former about three-fourths of that of the body. The colour black. The legs six, but of a lighter colour than the body. The proboscis large, long, cylindric, and jointed, ending in a *point*, which the insect in either state inserts into the leaf. When the animal couches at feed, this appears to issue from the abdomen; but on being raised upon the legs, it evidently passes to the snout. In walking it is carried under the belly, lying close to the thorax, and reaching about half the length of the body. The abdomen nearly globular; flattened at the apex; with a minute black club standing out on either side, as in the fly and louse.

From these insects having been observed to be extremely numerous on the seedling leaves of turnip plants, not *eating*, but, as it were, *sucking* their juice or sap through long probosces, that serve to attach them to the leaves in the manner of leeches, the intelligent author is led to conclude that they may be the cause of the very slow progress that is sometimes made by the young turnip plants to push into *rough leaf*.

\* Ellis's Agriculture Improved, vol. II.; Reynolds in Transactions of the Society of Arts; Mills's Practical Treatise on Husbandry; and Vagg's Letter.



in the state of fine powder, over the turnip crops by the hand, may likewise be occasionally employed with advantage both against the fly and slug, in the proportion of about ten or fifteen bushels of the first, and twenty of the others: the former by the powers which they possess of destroying such animals, their attracting humidity from the atmosphere, and their furnishing more abundant supplies of nourishment to the young plants; the last by its rendering the young plants nauseous and unfit to be fed upon, as well as the promoting of the more rapid growth of the plants. The sprinkling of water in which tobacco-leaves have been infused over the plants, from the tail of a cart, has also been suggested as useful on the same principle as soot against the slug\*; or, what is probably better, especially where the crop is not extensive, as being found highly successful in garden practice, the mixing of the tobacco-water with soap-suds and urine. The use of this composition is said not only to bring them up from their holes and habitations, by which they quickly die, but destroy the ova deposited in the soil†.

There are still other methods recommended for the purpose of preventing the depredations of this animal, one of which seems equally cheap, convenient, and effectual; which is, that of sowing barley chaff over the whole of the crop immediately on its first appearance, as by this means the slugs become directly entangled and destroyed. In the way of a palliative, it has likewise been sometimes a practice to turn a flock of sheep upon the turnip lands, keeping them constantly in motion by means of a dog and person to attend them‡. In this mode the slugs are shaken from the young plants, and destroyed by being trodden into the ground.

Against the ravages of the black caterpillar, which, as has been observed, take place in the more advanced growth of the turnip plant, the use of the tobacco infusion or mixture just mentioned may frequently be serviceable, and even the application of the barley chaff over the crop on the caterpillars first shewing themselves, taking care at the same time to pass a light bush-harrow over it in order to displace the animals from the plants to the ground. It has also been hinted, that the fly, from which this sort of caterpillar is produced, might be prevented from fixing upon the plants, by causing any thick offensive smoke to pass over the field, provided the period of its coming could be exactly

\* Corrected Agricultural Report of Middlesex, p. 210.

† Forsyth on Fruit Trees, 8vo. edition, p. 395.

‡ Corrected Agricultural Report of Middlesex, p. 210.



known, and the state of the wind be at the same time favourable\*. From the great uncertainty of these circumstances, the practice can probably seldom be had recourse to with success. Indeed, though an able and intelligent writer has presented us with much valuable information concerning this destructive caterpillar†, we are probably still too imperfectly acquainted with its natural history, economy, and habits of life, to direct the most speedy and effectual method of destroying it.

Besides the diseases arising from these causes, and which affect the leaves of the plants, the turnip is subject to a disease in its root. This is a large excrescence forming itself below the apple or bulb, which, after becoming in a state of maturity, takes on the putrid fermentation, and sends forth a most offensive smell. It has obtained the title of *anbury*. In several specimens examined by Mr. Marshall, the apples of the turnips were found just forming, as about the size of walnuts in the shell, while the anburies were as large as the egg of a goose, being awkward and irregular in their form, with inferior excrescences, somewhat resembling races of ginger, depending from them. On being cut, their general aspect was that of a hard turnip; but on being examined with more minuteness by means of a magnifier, veins or string-like vessels were observed dispersed through the pulp: the smell and taste being in some respect similar to that of the common turnip, but without its mildness, having an austere disagreeable flavour, approaching to that of an old stringy turnip. The tops in such as were much affected turned yellow and flagged by the heat of the sun, being easily distinguishable in the day-time from the healthy plants. This disease has often been ascribed by farmers to the land being too long continued under this sort of crop; but the experience of the author strongly opposes it, as he found the disease in turnips taken from land that had probably never borne that sort of crop before. The cause has, perhaps, not yet been fully investigated; but Mr. Marshall seems to suspect it to proceed from the wound or puncture of some sort of grub in the vessels of the tap-root, by which the course of the sap is diverted, and, instead of the natural apple or bulb being formed, this excrescence takes place. This is further confirmed by the circumstance of the disease being much connected with the dryness of the season. The only remedy that can be of much utility in cases of this kind, is probably that of removing the diseased plants as soon as possible, and stirring

\* Corrected Agricultural Report of Middlesex.

† Marshall's Rural Economy of Norfolk, vol. II.



the earth about those that remain, in order to supply them more abundantly with nourishment. But in order to wholly avoid the disease in those districts where it is apt to occur, turnips should only be sown on such lands as have been fully prepared and well enriched by manure.

On light thin soils, in dry seasons, the mildew is also a disease that is sometimes apt to affect turnip crops, and do great injury to the young plants by restricting their growth. The only remedy in this case is probably that of properly thinning the plants, and stirring the earth well about their roots occasionally, by means of the hoe, in order to provide them more fully with nourishment. Where it occurs in lands of a more retentive quality, advantage may likewise, perhaps, be obtained, by rendering them drier by deepening the ridge-furrows, or some other similar method.

It occasionally happens that turnip plants, instead of swelling and forming bulbs, send off numerous stringy roots, which soon decay and come to no account\*. It occurs most generally where the crop is sown on fresh land, and no remedy is said yet to have been discovered to prevent it†. More perfect tillage and the use of such manures as have a tendency to render such lands more mellow and friable, may perhaps be beneficial.

It is frequently a practice in many places where turnip crops have been eaten off by the fly, or destroyed in any of the ways that have been mentioned, to sow the same land over again, and harrow the seed in, without having recourse to the plough: this, however, is a method that should seldom or ever be adopted, as in such a mode of proceeding there must constantly be great danger of the plants of the second sowing being destroyed in a similar manner. It is perhaps always a better practice either to give the land a shallow ploughing, by means of a light plough, before such second sowing is performed, or to leave it entirely for a crop of wheat‡.

The seasons most suitable for turnip crops are those in which the weather is warm, with frequent showers, but little continued rain. In the autumn and winter periods, when frequent changes from frosts to thaws and rain take place, turnips commonly experience great injury, being rendered extremely subject to decay, and become rotten; and even such as withstand such seasons seldom afford a due proportion of nourishment to the stock that may be fed upon them.

\* This state of the turnip plant is often provincially distinguished by the terms *fingers and toes*.

† Corrected Agricultural Report of Lincolnshire, p. 136.

‡ Synopsis of Husbandry, p. 146.



Rooks, if not prevented, often do considerable mischief to turnip crops in the winter time, by picking holes in the bulbs, admitting the wet, and thereby causing them to decay \*.

The produce of turnip crops varies greatly according to the season, the nature of the soil, and the method of cultivation that is practised: but a medium crop, where the soil is good and suitable for the purpose, may afford fifteen tons, or something more, on the acre; in many instances it will, however, be much less. The value of these crops will depend upon various circumstances: as their quality and abundance; the manner in which they are consumed, as on the land or in cribs or stalls; in fattening or rearing different sorts of live stock; and the state of the markets in respect to the sale of such stock. In general it may be from about three to six or seven pounds the acre. It is found by experience that an acre of good turnips will be sufficient to fatten a beast of about forty stone, or eight sheep †. In feeding off in the open field, they are found to pay from two shillings and six pence to four shillings and six pence the ton, a crop of twenty tons producing in beef or mutton from fifty shillings to four pounds ten shillings, besides the dung and urine, which may be equal to fifty shillings more. When consumed by cattle in stalls, they are stated, however, to afford one shilling a ton more than when eaten by them in the field ‡.

In cultivating turnips for seed some attention is necessary, as, where it is collected from such turnips as have been sown three or four years in succession, the roots are apt to be numerous and long, and the necks or parts between the bulbs and leaves coarse and thick: and when taken from such as have been transplanted every year, these parts are liable to become too fine, and the tap-roots to be diminished in too great a proportion ||.

The most certain method is to procure seed from turnips that are transplanted one year and sown the next; or, if they be transplanted once in three years, it is supposed by some that the stock may be preserved in a proper state §. The method of performing this business is to select such turnips as are of the best kinds and of the most perfect forms, from the field crops, and, after cutting their tops off, to transplant them, about the month of November or December, into a piece of ground that has been put into a fine state of preparation by repeated ploughing or digging over, and which should be situated as near the house as

\* Synopsis of Husbandry, p. 148.

† Donaldson's Modern Agriculture, vol. II. p. 318.

‡ Corrected Agricultural Report of Middlesex, p. 208.

|| Kent's Hints.

§ Ibid. and Experienced Farmer, vol. I. p. 56.



possible, in order that the birds may be better kept from it. The seed will, in general, be ready for gathering in the July or August following\*.

Some, however, recommend that the seed collected from a few turnips thus transplanted, should be preserved and sown in drills, in order to raise plants for seed for the general crop, drawing out all such as are weak and improper, leaving only those that are strong and which take the lead; and that when these have appled or formed bulbs, to again take out such as do not appear good and perfect, as by this means turnip seed may be procured, not only of a more vigorous nature, but which is capable of vegetating with less moisture, and which produces stronger and more hardy plants. The practice of transplanting the whole of the turnips for seed for the main crops being contended to be not only highly expensive but injurious, by diminishing the strength of the plants from the destruction of their tap-roots†. Good seed may, however, be raised in either of the methods.

When the seed is become fully ripened, which is mostly about the times just mentioned, it is in some districts reaped by cutting part of the stems, and afterwards tying them up into sheaves, which, when sufficiently dry, are built into long stacks, and kept through the winter, in order to be threshed out about the periods when it is wanted, as in April or May‡. But as in this way much seed is liable to be lost, by its readiness to escape from the pods or sheaths in which it is contained, it is perhaps a much better practice to have it immediately thrashed out either upon a cloth on the spot where it grew, or in some convenient place at home. It should then be put into proper bags or vessels, and placed in a perfectly dry situation.

As crops of this sort are subject to much injury and loss in various ways, the quantity of produce must be variable; but it may in general be estimated at not less than from twenty to twenty-four bushels the statute acre. The price of turnip seed being seldom less than seven or eight shillings the bushel on account of the great demand for it, this sort of culture may at first sight appear highly advantageous; but if the exhausting nature of the crop, the loss sustained in that of a grain one, and the quantity of manure that must afterwards be applied, be considered, it is probably only in particular situations of soil and climate that turnip seed can be grown to much advantage.

\* Corrected Agricultural Report of Northumberland.

† Experienced Farmer, vol. I. p. 56.

‡ Corrected Agricultural Report of Northumberland.



In the application of turnips to the purposes of feeding and fattening different sorts of live stock, there is much variety in the practices of different districts; but the most economical and advantageous modes of consuming this highly useful root under different circumstances of soil, climate, situation, and animals, have probably not yet been sufficiently investigated or ascertained by cultivators.

Though few experiments appear to have been instituted with a view of determining the particular state in which these roots afford the greatest proportion of nourishment to the animals that feed upon them; it would seem, from their containing a much larger proportion of nutritious saccharine juicy matter while in their fresh or green state before being taken from the ground, than when taken from the land and preserved by being packed up in sheds or other places\*, to be a more economical and beneficial practice, especially where the nature and situation of the ground and the state of the season will admit of it, as on the dry soils in most of the southern districts, to consume them under the former than the latter circumstances; but in the more cold exposed situations, as in many districts in the northern parts of the kingdom, and wherever the lands are much inclined to moisture, as the roots may be greatly injured by the frosts, and the animals receive much injury from the coldness of such places, while feeding on them, as well as the lands be much damaged by their treading, it may be better to eat them under the latter. There are likewise other situations in which it may be particularly necessary, as well as advantageous, to make use of turnips after being drawn and removed from the land to places of security; as those where it is difficult or inconvenient to raise other sorts of green cattle food for winter and spring use. But wherever crops of this kind are taken from the ground to be consumed by animals in other places, as from their large growth and luxuriant nature they must tend greatly to exhaust and draw away its fertility†, it will constantly be necessary to return an equivalent in manure, otherwise the injury sustained in this way may more than equal the advantages of the turnip crops. The tap-roots of the turnips should, likewise, be broken off and left on the land, that neither soil nor manure may be carried away by adhering to them‡.

\* This is evident from their losing their firmness, and becoming soft, wrinkled, and flabby, and diminishing considerably in weight.

† Corrected Agricultural Report of the North Riding of Yorkshire, p. 148.

‡ Corrected Agricultural Report of Middlesex.



Where the lands are sufficiently dry, in a high state of fertility, and conducted under a judicious system of husbandry, it may often, however, be an advantageous and economical practice to have a partial recourse to both the methods; by having one part of the crop drawn and removed to be eaten in some convenient situation off the land, according to the particular circumstances of the case, and the other consumed in the field where they grow: as by such means a much larger quantity of ground may be benefited and improved, without injury being done to the crops that may be afterwards cultivated on the land\*. This method of rendering arable grounds proper for the growth of turnip crops seems to have been too much neglected, considering the great advantages that may be derived from it in the feeding and rearing of live stock, as well as in the amelioration of the land†.

The nature of the animals by which turnip crops are consumed must obviously introduce differences in the manner of their application. When they are employed in the rearing or fattening of neat cattle, they are generally pulled up and eaten either after being conveyed to some convenient dry piece of ground in the state of grass or stubble, or some place of security contiguous to the straw-yards or feeding-houses; in the latter methods, the turnips being given to the animals in bins or cribs, or placed before them in stalls constructed for the purpose, in which the cattle are tied up. The last is probably the better practice, though not so frequently employed; as there is the least possible waste, at the same time that the dung and urine of the animals are the most effectually preserved. In the first method the fat stock are first admitted, the lean following to eat up what may remain: they are often constantly confined upon the turnips, except when prevented by the severity of the season, in which case the straw-yard is generally made the place of their consumption. The lands to which also turnips are removed in this way of feeding, are, in some districts, those in-

\* Kent's Hints, p. 116.

† Ibid. It is observed by the same writer, that where the crops are good "twenty acres will at least fatten fifteen bullocks, and support ten followers, or store cattle, for twenty-five weeks; or sheep in the proportion of eight to one bullock;" besides the advantages in preparing the land for other succeeding crops, which he considers as far greater than the other "in point of real profit." For he thinks it evident, that most of the estates in the county of Norfolk have been improved in the proportion of at least forty *per cent.* solely by marling and adopting this mode of raising turnips; as many thousand acres now produce fine crops of grain and turnips, and support a prodigious number of sheep and other sorts of stock, which were formerly covered with various kinds of coarse plants and unproductive.

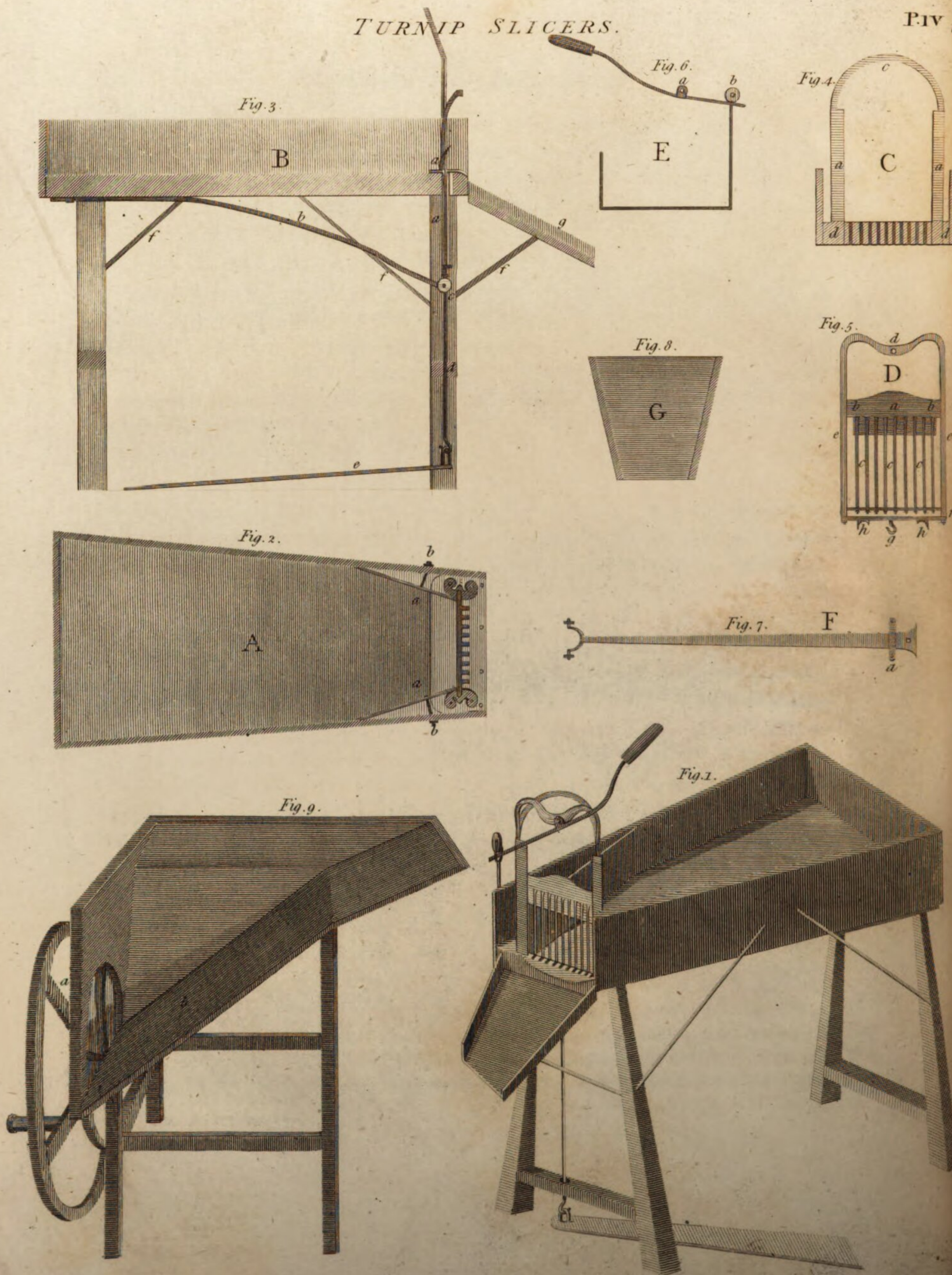






# TURNIP SLICERS.

P. IV





## PLATE IV.

### *Turnip Slicers.*

[To face Page 671, Vol. II.]

*Fig. 1.* REPRESENTS an improved *Turnip Slicer*, invented by Mr. Martin of Clifton, Nottinghamshire.

A. *Fig. 2.* Plan of the trough, showing the iron plate, &c. to receive the cutting-knives with the conductors, *a a*, made of plate-iron fastened with bolts, nut, and screw, *b b*.

B. *Fig. 3.* A section of the machine, showing the cutting-knives, &c. *a a*, edgeways, which are supposed to be drawn down: *b*, the spring with brass wheels at the end: *c* is for the purpose of raising the knives with more ease, and is kept in its place by two small pieces of iron plate fastened to the bottom of the knife-frame, so as to allow for the different lengths of the spring according to its situation: *d*, an iron rod hooked into a swivel in the knife-frame, and extending to the treadle *e*. N. B. The treadle may only be used occasionally, when the handle is not found sufficient: *fff*, iron braces for steadying the legs and supporting the spout *g*.

C. *Fig. 4.* Shows the frame through which the knives with their frame slide, grooves being made in the sides, *a a*, to receive the same. The circular part at top, marked *c*, is bent back (as may be seen) in the section B, to make room for the nut and screw which fasten the handle to the knife-frame. This frame is fastened to the bottom, *d d*, by cheeks, as may be seen in the plan A. In the section of the bottom, *d d*, are shown the holes through which the small knives pass.

D. *Fig. 5.* The cutting-knives and frame: *a*, the great knife which, when in action, sinks into the long groove up to the shoulders, *bb: ccc*, the small knives which are fixed at right angles with the large one, the tops of which are riveted into the large knife; the lower ends of the same are kept at equal distances, by being let through a small bar and fastened with a nut, a worm being made at the end of the knives. The frame which carries these knives is fastened only to the great knife, *bb: d*, a hole in the frame to fasten the handle to. The sides, *ee*, have a worm at the bottom, by which the bar *f* is fastened to the same with nuts: *g* the swivel for the treadle bar: *h h* the guides for the brass wheels to the spring. It will appear that the great knife being fastened to the frame, the small knives will necessarily project before the same.

E. *Fig. 6.* The handle and guide to the same: at *a* the handle is fixed with a screw-bolt and nut to the knife-frame, so as to move easily: *b*, a brass wheel fixed in an iron strap screwed to the machine, so contrived that the end of the handle will pass through an opening below the wheel, the use of which is to act as a rest to the extremity of the handle, and to prevent friction, its situation varying considerably with the motion of the knife-frame.

F. *Fig. 7.* Plan of the iron spring which raises the knives, made two inches wide at one end and about one at the other, and a quarter of an inch thick, fastened at the end with a nut and screw to the bottom of the trough with a strap near the end.

G. *Fig. 8.* Plan of the spout.

The turnips, when small, are put to the knives by a piece of board, the length of the knives, about four inches broad, with a handle at the back. Great turnips may be put to the knives without this instrument, but in small ones there is danger of cutting the fingers. The machine will cut turnips into pieces  $\frac{1}{2}$  inch by  $\frac{3}{4}$  square; and, of course, (if the turnip be large enough)  $4\frac{1}{4}$  long.

*Fig. 9.* Represents a *Turnip Slicer* upon a different principle: The turnips in this machine are cut by means of a knife fixed on the fly wheel *a*, being brought to it through the inclined trough or box *b*.







tended to be ploughed up the ensuing year for wheat or other sorts of grain; consequently each field, in its turn, has the advantage of having such crops consumed upon it, which is found more beneficial than feeding them on the land where they grow\*. The turnips in these cases should not be scattered over the ground in too thick a manner; as, where that is the practice, much loss must be sustained by their being crushed and bruised by the feet of the animals. All these different practices are met with in the county of Norfolk, where great numbers of different breeds of cattle are annually fattened upon turnips.

In most of the turnip districts in the northern parts of the island, when converted to the purpose of rearing young stock, they are generally consumed in the straw-yards, when the farmers have the advantage of such conveniences; but in other cases, in the same manner as above.

Near large towns, where milk is a principal object, turnips may likewise often be applied in the way of a rich succulent food for milch cows; but in this mode of using them great care should be taken that all the putrid and decayed leaves or other parts of the turnips be removed, otherwise the milk may be liable to derive an unpleasant flavour from them†. The offal produced by these means may be made use of for the dry stock, and of course little or no loss be sustained.

Turnips have also been found to be capable of being applied in the feeding of labouring horses with much success; as by their use the usual quantity of corn may be lessened in the proportion of nearly one-half, and the animals not only improve in condition, but perform their business with greater ease and be less subject to complaints of the bowels than when fed in the ordinary way‡. Where employed in large proportions in this mode of application, as they are extremely succulent, it may be advantageous to have them prepared by means of fire, as by steaming; but in other cases, where they are used in only a small quantity, they may be given raw, after being sliced or cut into small pieces by a machine constructed for the purpose, a proper proportion of dry food being given at the same time.

In the consuming of turnips by sheep, which, where the most valuable breeds

\* Corrected Agricultural Report of Northumberland.

† Corrected Agricultural Report of the County of Perth, p. 184. It is observed in the same work, that where such a taste prevails, it may be completely removed by making use of a very weak solution of nitre in water.

‡ Farmer's Magazine, vol. II. p. 249.



are introduced, is the most extensive application of such crops, the most general practice, where the lands are light and sufficiently dry, is that of confining them upon a suitable proportion of the crop, by means of nets or hurdles, removing them to fresh portions or *breaks* every eight or ten days, or oftener, according to circumstances; but if the grounds be of the more heavy kind and somewhat retentive of moisture, it is a better and more economical method to have the turnips conveyed off the land to some neighbouring field, as has been already noticed, as by this mode there is not only less injury and waste by the treading of the turnips into the ground, but the sheep get a more regular supply of fresh food, and the shells, by being left clean, are more completely eaten up by the store cattle that are to follow\*.

Where the custom of eating on the ground is employed, it is also sometimes, as when the land is poor, a practice to draw every other ridge of turnips, and remove them from the field to be eaten in another place, while the remainder is consumed upon the land on which they grew†.

In folding upon turnips it is mostly the custom to turn the sheep upon them while standing in the field; but, except where the bulbs are much exposed above the surface of the land, it is probably a much better practice to have them drawn up before the hurdles are fixed or the sheep turned in, as the animals are not only less apt to break and soil the turnips, but feed much better upon them. This is a method of proceeding not unfrequently had recourse to in the county of Norfolk‡.

Whatever method may be adopted in fixing the hurdles, attention should be paid to set them in such directions as that expence and labour may be saved as much as possible.

It has been suggested by a late writer, that much loss is often sustained in these modes of folding sheep upon turnips, especially where they are cultivated under the broadcast system, and it is the custom to give the sheep large folds or *breaks* at a time, from the occurrence of frost and snow. In such cases he thinks the drill or ridge methods far preferable; it being easy to have sheep-penns or turnip-trays made and fixed in such a way as to constitute a sort of moveable trough, the bars or trays being set near the side of the rows of turnips, and boards from ten to twelve inches in breadth, having

\* Corrected Agricultural Report of Northumberland.

† Ibid. and Corrected Agricultural Report of Norfolk.

‡ Modern Agriculture, vol. II, p. 316.



stakes of suitable lengths, according to the depths of the soils, nailed to them, fastened on the sides from which the sheep feed: the narrower the spaces the turnips are included in, the better. As it may be apprehended that the animals may get in among the turnips thus fenced off, it is remarked, that supposing they occupy a regular space of about twelve inches, the troughs may be made little more than a foot in width at the bottom, having a sloping direction upwards. The trays or bars may likewise have an inclination towards the sheep, and hang over the troughs or parts in which the turnips are inclosed, and thus prevent them from getting in.

In this way it is supposed the sheep will have their food quite clean, and, by setting off at a time only the quantity necessary for a day, they may eat it with more avidity and without the danger of spoiling so much by their excrement.

If it should be objected that this method is only suited to small concerns, he maintains that, on examination, it will be found even on a large scale to be better in many respects, as well as considerably cheaper, as “on the *lowest* calculation three sheep may be kept in this way to two by the old method—perhaps even double the number, and they will fatten much sooner\*.” It is added, on the principle that animals do not feed so well when a redundance of food is placed before them, that if the sheep in such cases were driven into the straw-yards during the night, and even to eat straw in the morning, they would retain the turnips longer, and fatten quicker; and in the mean time the persons employed in looking after them might move the hurdles a row further, and thus little time be lost. If both feeding and store sheep should be kept in this way,

\* The advantages of this method are calculated by the author this way:—Suppose, says he, two hundred sheep to employ one man and boy every day, and admitting the boy to be unnecessary in the common method, but allowing one shilling per day for him; and estimating the same quantity of turnips to keep three sheep that was employed for keeping only two; then three hundred sheep may be kept where only two hundred were kept: and estimating the profit on one hundred sheep at only two pence a-head per week, the amount will be 16*s.* 8*d.* for that length of time; and deducting from it the extra expence of 7*s.* for the boy, there will remain a clear profit of 9*s.* 8*d.* per week. But where the flock is larger, the profit will, it is observed, increase in proportion; as a man and boy are capable of managing four hundred sheep. Two hundred are, however, sufficient to be fed together; but by dividing four hundred equally, they can be managed by the above number of persons.

The writer is, however, clearly of opinion that *two* sheep may be kept in this way for *one* in the other. If so, says he, the amount would be 1*l.* 13*s.* 4*d.* per week, which in twenty weeks would come to 33*l.* 6*s.* 8*d.* a sum that would more than clear the expences of the boy and the extra pen the first season.



it would be advisable, he observes, to give the feeding stock rather more than are sufficient for the day, and to turn in the store sheep the succeeding day to consume what may be left. In this method the length of turnips that is necessary without much waste being committed may soon be discovered \*.

This plan of consuming turnip crops may be economical and advantageous where the number of sheep is not great; but where it is very large, the constant trouble, difficulty, and expence, of procuring the hurdles and fixing the folds, must frequently render it incapable of being put in execution.

It has been found in the fattening of sheep with this root, that they make the greatest progress just before the turnips begin to run and form their seed-stems; a circumstance which probably depends partly upon the turnips containing at such periods the largest proportion of saccharine nutritious matter, and partly on the weather becoming more dry and warm. Hence it is a practice in some districts, towards the latter end of March or beginning of April, according to the state of the season, to mow off the shoots or stems that are advanced, with a scythe; as by this means, from the numerous lateral shoots that are sent forth, a more copious supply of green food is not only afforded, but the roots or bulbs of the turnips preserved longer in a state fit for use †.

In folding sheep on turnips, it frequently happens that after frosts or snows the hurdles get loose, and are either thrown down by the animals or the wind: great care should, therefore, be taken to have them at first well set into the ground, and secured by stakes of sufficient length, with proper *wyths* for tying them together.

The hurdles employed for this purpose are generally of two kinds, either *flatted* or *rodded*; the former being made from small poles of ash, willow, or other tough sorts of wood, by splitting them; and the latter from rods of hazel, or other suitable woods, by wattling them close together with suitable cross pieces like stakes. The *flatted* hurdle, or what in some districts is termed *waddle*, is much preferable to the *close-rodded* or *wattled* kind, as being much more durable. The first cost of them is, however, considerably greater ‡. There is also another sort of material made use of in some districts for this purpose; which is a sort

\* Experienced Farmer, vol. I. p. 59. † Synopsis of Husbandry, p. 148.

‡ The former sort are mostly sold in the neighbourhood of London, at from about 16s. to 18s. a dozen, and the latter at from 10s. to 12s. the dozen. Toiling is generally from about 2s. 10d. to 3s. 6d. the rod.



of net-work, formed of small cord, called *toiling*. This method is, however, more expensive than that of hurdles, and less convenient; but may save something in carriage, where hurdles are to be brought from a considerable distance.

Where turnips are intended for the feeding of cattle, or other sorts of stock, in the winter and spring months, as they are extremely liable to be destroyed by the sudden alternations of frost and thaw, becoming in many cases quite rotten and unfit for use, it is necessary to preserve them by some means or other during that season. For this purpose many different methods have been attempted, but probably without any of them being completely successful. The only perfectly secure method of protecting them against the effects of intense frosts in such seasons, is perhaps that of having them drawn, topped, and piled up with dry straw in houses constructed for the purpose, contiguous to the cattle-sheds, or feeding-stalls. This mode is, however, liable to objection, as being both troublesome and expensive, especially where turnips are cultivated upon an extensive scale. There is, however, another method which has been found very effectual, and which is less expensive, and attended with but little trouble; which is that of stacking them upon the field where they grow, with layers of dry straw betwixt those of the turnips. This is a mode frequently practised in the county of Hertford, where they use one load of straw to about thirty or forty tons of turnips. The manner of performing the business is this: the turnips being drawn during a dry time, and the tops and tap-roots removed, a layer of straw is spread on a dry part of the ground, and a layer of turnips placed upon it to the thickness of eighteen inches or two feet; after this another layer of straw, and then a layer of turnips, proceeding alternately in the same manner till the heap or stack is brought to a ridge or point; when the edges of the different layers of straw are turned up, which serves to prevent the turnips from falling out, and at the same time affords a sort of external covering to the heap, which is completed by being thatched well over the top with long straw. They have also been attempted to be preserved by being formed, without straw, after the tops have been cut off and used as a green food, into what are termed *pies*, in the way that potatoes are sometimes kept, being well thatched over on the outside\*.

It has likewise been suggested, that the difficulty of getting them up, and the dangers they are exposed to during frosty seasons, as well as the inconveniences

\* Corrected Report of Middlesex, p. 209.



the cattle experience in feeding upon them from their coldness, may be prevented by piling them up in small stacks, the tops outwards, near to the places where they are intended to be consumed, with a little straw between the different layers, covering them over with wattles or hurdles lined with straw. If this practice was adopted on small portions, it is supposed that much advantage would arise from it to the cattle in frosty weather, besides the turnips being preserved and prevented from exhausting the land by remaining so long upon it. The same advantage may also, it is believed, be obtained, by sinking beds about two feet deep, and of considerable breadth, in the ground where the turnips grow, putting five or six layers of turnips into each, with a little fresh earth between every one of them, and covering the tops over with straw\*. This method seems, however, only capable of being employed with safety where the soil is of a light porous sandy quality, and of course not retentive of moisture.

There are still other methods that have been recommended for preserving this root. The practice of drawing the turnips, cutting off the tap-roots, and carting them to a piece of pasture-ground adjoining the farm-yard, to be set together upright upon their bottoms, as close as possible, has been found successful in some districts. The growth of the tops is, it is observed, in this way but little interrupted, thus consequently affords a full compensation for any waste of bulb that may take place. And it is believed that the quantity of nutritious food is increased. The business is best performed when the weather is dry and windy, as the tops are then less brittle and the roots in the cleanest condition†. It has also been advised, by the intelligent author of the *Corrected Report of the Agriculture of the County of Middlesex*, that trials be made of carting the roots during the time of hard frosts into heaps, placed on bottoms of ice, and blending with them ice and snow in such a manner as that they may be preserved in a frozen state as long as may be necessary, as the end of April. In this view they should be placed either in proper buildings, or be well covered over with straw, fern, or heath, and have earth placed over such coverings in the same way as is practised in piling potatoes in particular districts. This method, it is conceived, may be of great utility, as the frozen heaps will be secure against the thaws that take place on the breaking up of every intense frost. In using the turnips thus packed up, it is recommended that they be

\* Kent's Hints, p. 121.

† *Corrected Report of the County of Suffolk.*



given to the animals after the frost has been removed by putting them into cold water. And as the land may in this way be cleaned of such crops at a more early period than usual, great advantages may, it is contended, be gained to the crops that are afterwards cultivated on it.

As the living principle of vegetable roots is extremely liable to be destroyed by freezing, and their tendency to putrefaction thereby increased, it is probable, however, that in this way the turnips will be in great danger of becoming rotten, if they be not immediately consumed after the heaps are first opened, and of course much loss be sustained.

It seems not improbable but that turnips might be well preserved against severe frosts, at least on a small scale, by the application of straw, fern, or any similar light substance that has the power of resisting its operation, along the rows as they stand in the field, as is frequently practised in the garden culture of different kinds of vegetables. Such sorts of materials might be applied in a cheap, convenient, and expeditious manner, by women and children; proper means, according to circumstances, being provided for securing them upon the plants; the matters thus employed being afterwards either removed or turned into the soil, as may be found most suitable and convenient to the cultivator.

Whenever the preservation of this root is attempted in heaps, great care should be taken not to have them too large or too closely packed together, as by that means the danger of their heating and being spoiled may be considerably lessened.

By these means, it is obvious, turnips may be preserved both as a winter and spring food for different sorts of live stock, even in situations and seasons that are the most exposed and severe. Where sheep husbandry is carried on upon an extensive scale it may indeed frequently be a more advantageous practice to have recourse to this root for the ewes in the spring months, than to consume them during the winter in fattening neat cattle; as in this way they will be better enabled to bring forth and provide for their lambs, which are circumstances of great importance. But in mild seasons, when sheep do not stand in need of them, or are not kept in any great number, it may be the most beneficial method to apply them to the fattening or keeping of store cattle; in the latter of which the animals will be brought into such a state of forwardness, as to be readily completed on grass in the ensuing summer\*.

\* Corrected Report of the County of Perth.



In feeding turnips off by all sorts of animals, attention should be paid on their first being turned upon them, that they do not remain too long, otherwise they may be much injured by the distention which is occasioned by their eating too greedily of them.

*Ruta Baga, or Swedish Turnip.*—This is a root of the turnip kind, that has long been known, but only lately introduced into cultivation with much advantage. It has been considered by some as a variety of the yellow turnip, but it differs greatly from it both in its texture and properties. In its top it has something of the appearance of the rape or the cabbage; the bottom, or that part of the root which is above the ground, is covered by a thick green tough cuticle or skin, and the internal fleshy part is of a dense firm consistence, having a yellowish tinge. It is suspected by some cultivators that there are two varieties of this plant, the one having a *white* and the other a *yellow* root, the latter being considered as much the best. This may, however, probably arise from their having been grown in the neighbourhood of plants of the turnip or cole kinds\*.

It may be grown to advantage on most of those soils that are too moist and heavy for the common turnip; but the land should be brought into a tolerable state of pulverisation, and be well impregnated with manure, before the seed is put into the ground, or the plants put upon it. It is perhaps from the want of this due preparation of the land, and the putting in seed of a bad kind and at too late a period, that cultivators have so frequently failed in obtaining good crops of this valuable root.

*Seed.*—The seed should be constantly collected from such plants as have been transplanted, and which are the most perfect of their kind; as where this is neglected, the cultivator can never be certain of having his plants of the proper sort. The quantity of seed that is made use of where the broadcast method is employed, is generally about two pounds to the acre; but where the drill plan is pursued a smaller proportion may be sufficient; but as it is mostly found difficult to produce a sufficient plant, it may be advisable never to be too sparing in the article of seed. New seed is constantly to be preferred; and when the season is dry, it may be of utility to have it prepared by steeping.

*Time and method of sowing.*—As this plant is much slower in its vegetation than that of the common turnip, it ought to be put into the ground at an earlier

\* Corrected Agricultural Reports of the North Riding of Yorkshire and Nottinghamshire.



period; by which means it will not only be more forward for the hoe, and more fully established in the soil, but better protected from the attacks of the fly and the heats of the ensuing summer months. It has been the usual practice to sow this crop at the same time with that of the common turnip; but if put in three weeks or a month sooner it will be found more advantageous, as from about the tenth of April to the tenth of May, or perhaps a little later in the northern districts\*.

Different methods are practised in raising this sort of crop: sometimes instead of sowing the seed over the land in broadcast or drills, it is sown upon beds of good earth; and after the plants are sufficiently advanced, as when they are about the size of small cabbage-plants, they are transplanted into the field, and set out in rows at the distance of eight or nine inches from each other, and a foot or more in the intervals. The business of transplanting should, if possible, be performed when the weather is moist.

This may be the best method where such crops are cultivated only upon a small scale; but where they are grown more extensively, the former are to be preferred, as being more expeditious and convenient, as well as more certain of affording a sufficient plant.

*After-Culture.*—In this part of its management, the Swedish turnip, from its growing in a more slow manner than the common one, requires more attention, in order that it may be kept perfectly clean and free from weeds, which under such circumstances are extremely apt to rise. The operations of hoeing are to be performed in a similar manner to those for the common turnip, and repeated as frequently as may be necessary, keeping the mold well broken and laid to the roots of the plants. These plants, besides being subject to injury from the same causes as those of the common turnip, are liable to be greatly hurt by hares, rabbits, and different kinds of birds, feeding upon both their tops and roots, which sometimes are almost wholly consumed by them.

In respect to the quantity of produce, there seems to be considerable difference of opinion among cultivators; but where the crop is put in sufficiently early, and the ground prepared and managed in the manner that has been directed above, it will probably nearly equal that of the common turnip. And when it is considered that the roots are more solid, and abound more with nutritious matter, the *real* quantity of food which they afford may probably be

\* Corrected Reports of the Northern Counties of Scotland, and Nottinghamshire.



greater. In an experiment in the transplanted method, upon ridges of the same dimensions as those used for the common turnip, the produce was found, after they had sustained the frosts, in the month of March, without either tops or tails, and when perfectly free from dirt, to be thirty-two tons on the acre \*. And as an advantage in the feeding of horses for a few acres, they have been estimated as high as thirty pounds the acre †. With others the crops, on trial, have likewise been found in general to be heavier than those of common turnips; though in appearance, from the closeness of their texture, they did not seem to equal them ‡. It is obvious, however, that in common the quantity of produce on the acre must fall considerably below such estimates, and the value of the crop in any application be rated much lower.

There can be little doubt but that this root may be of great utility and advantage in its application in the keeping of live stock in the late winter and early spring months, when the common turnip is liable to spoil and run to feed; as it is much more easy to preserve in a sound state, being found, when taken up, to resist the effects of the season without any difficulty or trouble, though when left in the ground sometimes liable to be injured §. By being stacked, and having the tops removed when they first begin to shoot, they may be kept till the latter end of May ||, or even much later. In this way they supply the farmer with a valuable food, for the difficult and distressing period when turnips or other sorts of food become scarce, useless, or exhausted, and the grass is not ready. Every cultivator, who has ground suitable for it, ought therefore to have a quantity of this sort of crop proportioned to that of his live stock, to bring to his assistance the latter end of March and in April, or perhaps later.

Neat cattle are said to fatten considerably faster upon this root than that of the common turnip: and when given to milch cows, it has not it is said the effect of injuring the flavour of the butter so much, but communicates to it a fine yellow colour ¶. It has also the property of rendering the milk more rich.

Sheep are found to be extremely fond of feeding upon it; but its hardness renders it more difficult of being eaten. And for hogs it is said to be equal to

\* Close, in Bath Papers, vol. IX.

† Daikin in Corrected Report of Nottinghamshire.

‡ Tuke's Corrected Report of the North Riding of Yorkshire.

§ Anstruther, in Young's Annals, vol. XVI.

|| Close, in Bath Papers, vol. IX.

¶ Ibid.



potatoes\*. In the keeping of labouring horses it is likewise asserted to be of the greatest utility, rendering less oats necessary, and not proving of so laxative a nature as most other roots. The method of applying it in this intention is, after cutting off the tap-roots, to have the rest of the bulb cut or chopped, being first well washed, into rather large pieces, by means of a sharp hoe acting in a perpendicular manner, a suitable quantity of the roots being put into a sort of high tub contrived for the purpose. More than are necessary for the consumption of the day should not be cut at a time, as they are liable to be much injured by becoming dry.

But though the *ruta бага* appears to be a root of considerable utility, especially for the more northern districts, where the common turnip must frequently fail from the severity of the winters, it has been objected to as being injurious to the teeth of sheep from its great hardness, as difficult of being raised from the ground on account of the number of its roots or fangs, and as hurtful to the land from its being continued upon it to so late a period: but where it is cultivated and managed in the manner that has been mentioned above, there will be little danger to be apprehended from the first; and in taking up the roots, where the soil has been in a proper condition for the crop, there is by no means that difficulty or trouble that has been supposed; and the hurtful effects of their remaining upon the land to so late a period, and thereby preventing it from being seasonably prepared for other crops, may be easily obviated by drawing and stacking, or by arranging the roots close to each other in an upright manner in any convenient situation, as in these ways they will not sustain any injury from the severity of the season. There can be little doubt, therefore, from the many valuable properties which the root possesses, in addition to that of its continuing solid, juicy, and fit for the purposes of food, which is not the case with the common turnip after it has perfected its seed, that it may be found of great advantage as an assistant to turnips on all such farms as stand much in need of late spring feed for the support of live stock.

*Cabbages.*—That the culture of this vegetable is of great importance, as a winter and spring food for different sorts of live stock, on all those stiff and strong soils that are too moist and heavy for the successful practice of the turnip husbandry, is sufficiently shewn by the great advantages that have been derived from it in those districts where it is grown to a considerable extent. And this is

\* Corrected Report of the North Riding of Yorkshire.



farther enforced, by the little danger that attends the crop, and the largeness of the quantity of food that is produced; as it has been found to be considerably larger, in proportion to the space of ground that is occupied, than that of turnips.

In the field culture of cabbages, several different sorts are capable of being employed; but those varieties that are the most useful as cattle food, and the most capable of withstanding the severity of the winters in this northern climate, are the *Scotch*, the *Drum Head*, the *American*, and the *Open Green* cabbage or *Spring Kale*. The first, when of the true firm flat-topped kind, has been found to be wholly incapable of being injured by frost, except, in some cases, a few of the outside leaves. The second sort, or true drum-head, is likewise extremely hardy, and more close in its texture than many other varieties, being of course very heavy in proportion to its size. It admits of being planted closer than the large American cabbage, which in particular situations is an advantage. This sort is known in some districts by the name of the *tallow loaf* cabbage; but it would seem to differ from it in some respects. As this kind is not found sufficiently hardy to bear the effects of very severe frosts, a mixed stock is frequently employed, which is produced by planting it and the common red cabbage together, and, after the feed-pods are formed, cutting down the latter, and leaving the former for feed. This mixed kind, which is of a deep green colour veined with purple, besides retaining the size of the drum-head, possesses the hardness of the red cabbage. The third, or American kind, has not only a large size, but continues good to a late period in the spring\*. The last, or kale sort, is perfectly hardy, and capable of being converted to use as a cattle and sheep food, at the latter end of April or beginning of May, when other sorts of green feed are extremely scarce and difficult to be procured†.

Besides these, the varieties known by the titles of the *Flat Dutch*, the *Yorkshire*, the *Savoy*, and several others, may be made use of in situations where the climate is more mild‡.

The chief advantage of planting large-sized cabbages in the field is, that of their being capable of being set out at such distances as to readily admit of being cleaned and kept in order by the plough, without any loss being sustained in the quantity of produce. Where the soil is not of great staple, and

\* Bath Papers, and Young's Annals.

† Modern Agriculture, vol. II.

‡ Martyn's Edition of Miller's Dictionary, art. *Brassica*.



the expence of hand labour reasonable, the smaller sorts may occasionally be made use of with advantage.

From the great size, and the roots of plants of the cabbage kind penetrating into the ground to a considerable depth, they should constantly be planted out in such soils as are strong and have a good depth of mold; as where this is not the case they seldom attain their full growth. The moist friable loams and loamy clays, on which turnips cannot be grown to advantage, are probably the best adapted to this sort of crops; but they may be raised with success on almost any of the heavier descriptions of land.

In the preparation of the ground, as the roots of the plants run deep, and stand in need of a large proportion of nourishment, a considerable degree of pulverisation should be effected, and the soil be well loosened to a good depth. These effects may be produced in the most perfect manner, by repeated deep ploughing, and exposing as large a surface as possible to the action of the frosts during the winter season by laying the land up into pretty high ridges. Three ploughings are mostly found sufficient for this purpose; but the number should always vary according to the nature and state of the land. When this sort of crop succeeds wheat, barley, oats, or beans, the land is generally ploughed up in the autumn by a pretty deep furrow, and formed into ridges of about three feet in width; in this state it may continue till the spring, when it should be well broken down by harrowing in different directions. It is then to be ploughed again, but with somewhat less depth than before. After this, as near as possible to the time of planting, the ground may again be well harrowed over, and a suitable proportion of good stable manure applied, as from fifteen to twenty three-horse cart loads to the acre; or, where composts are made use of, from twenty to thirty, and immediately turned into, or inclosed in, the middle of the ridges. After this is accomplished, the land becomes ready for the reception of the plants. In some districts, however, a practice prevails of spreading the manure upon the land and turning it in with the first ploughing. In this way the ground is supposed to be prevented from becoming too open by the action of the manure, and the danger of the plants being injured in drouthy seasons prevented. It is obvious, however, that in this mode much of the benefit to be derived from the manure must be lost by its remaining so long incorporated with the soil before the plants are put in, and that the great advantage of having it in its most active and concentrated state immediately below the roots of the plants must be wanting.



*Seed.*—In the selecting of seed for raising young cabbage-plants, great care should be taken that it be procured from the most perfect plants of the different kinds, and such as have seeded without any others of the *same tribe blooming* near them, as it is perhaps only in this method that they are capable of being kept of a true kind. In this intention it may be of great advantage to have the plants intended to stand for seed planted out by themselves in a piece of ground at a distance from the others; and as birds are remarkably fond of the seed, well secured from them.

In purchasing seed of this sort, such as is new should always be preferred, as it not only vegetates much quicker, but is more to be depended upon for a proper supply of plants. In dry seasons, steeping the seed in water, or some other liquid, may also be of utility. The beds on which the seed is sown should be of a good rich quality, well prepared by digging and the application of manure; as, where the soil is poor and not sufficiently enriched by manure, the plants are apt to be weak and stunted in their growth, as well as much injured by the rising of weeds. Much injury frequently arises to young cabbage plants from the seed being sown too thick; care should, therefore, be taken to have them properly thinned out whenever they come up in too thick a manner. One ounce or an ounce and a half of good seed may in general be sufficient for sowing a bed fourteen or fifteen feet long, and five or six feet in width, or for raising two or three thousand good plants; in which proportion half a pound will afford more plants than are sufficient for planting an acre\*.

*Time of Sowing.*—The periods of putting the seed into the ground must depend much upon the intentions of the cultivator: where the produce is to be consumed during the winter months, as in December, January, or February, the seed should be sown in July the preceding year, and the plants be put out in March, April, and May, the following year; but if it be intended for consumption in March, April, or May, the seed should be put in about the latter end of February or beginning of March in the former year, and the plants be set out the first or second week in July in the same year. By continuing to sow with regularity in the months of February, May, and July or August, successive crops of young healthy plants may be secured, and the round of cabbage husbandry be effectually preserved. These periods of sowing and transplanting should, however, be attended to with considerable exactness, in order

\* Young's Annals, vol. V.



to secure good and certain crops, and the seed-beds be well protected from birds. And that the cultivator may not be disappointed in the number of plants, it may be useful to sow a little seed at different times, at the distance of a few days, always choosing as moist a time as possible. But by hastening or protracting the times of transplanting, or setting out the crops, the growth of the plants may be so managed as to have them ready for use either more early or later, according as circumstances may require. In both the spring and autumn plantings it is, however, the best practice to be sufficiently early; as in the former case the plants will have the great advantage of the spring showers, and be less in danger from the heat of the summer season, and in the latter more fully established in the soil before the winter sets in, as the growth of the plants after September cannot in any degree be depended upon in field culture. Besides, from the length of time which is requisite for their attaining their full size, it must always be advantageous to have them set out early. They seldom arrive at their full growth in less than four months.

By sowing very early in the spring, and setting the plants out as expeditiously as possible, both full and forward crops may often be obtained. There is, however, in general, an advantage in the autumn plants, that though they be more liable to be injured in the winter by flugs, and other causes, they are in a state to be planted out very early in the spring, while those of the spring sowings can seldom be set out till the summer is much advanced\*. In this planting different methods have been attempted, such as setting out the plants to stand the winter in the field, and letting them remain in the seed-bed to be put out in the spring; the former is the most advisable in mild winters and sheltered situations, as the crop will be much more forward; but in exposed situations the latter may sometimes be adopted with advantage.

By sowing in May or June, forward crops of large cabbages may be procured the ensuing year, or coleworts for the following spring; but in this last intention they should be planted closer together than usual. In this way the loss of weight, and danger of cabbage crops in the winter months, are fully obviated.

On the whole, the sooner the autumnal plants are put out in the field after the frosts are over, the better; and the spring plants should be placed out as soon as possible after them, as before the end of April. It is the custom of some nice

\* Miller's Dictionary, art. *Brassica*.



cultivators to prick the plants out from the feed-beds, while very young, into other beds; and the practice is certainly advantageous, not only in checking their too forward growth, but in rendering them more fit for planting and less liable to run to seed when transplanted into the field \*. The expence and trouble of this operation is, however, too great, where the cabbage culture is conducted on an extensive scale, to admit of its being generally performed.

*Method of planting.*—In the planting out of this sort of crop, care should be taken to have the business performed as soon as possible after the land has been well saturated with rain; as in this case the plants much sooner establish themselves in the soil, and fewer vacancies are left by their decay to be afterwards filled up. The plants are likewise much more readily raised from the feed-beds, and with much less injury to their roots, which is a matter of more importance than is generally supposed. The business is performed upon the land when in its flat or level state, and also when raised into ridges by means of the plough; but the latter method is the more general, and ought probably to be preferred wherever the soil is much inclined to the retention of moisture. On the lighter and more dry soils the flat surface may, however, be more advisable.

The distance of planting must depend in a great measure upon the strength and goodness of the soil, and the natural size of the variety of cabbage that is employed; but in general it should be such as that the ground between them may be cultivated and kept clean by the plough, and yet admit of bearing a full crop. It is obvious that where the plants stand thin they will attain a larger size, while in close planting there will be a greater number upon the land, which may compensate the disadvantage of want of size. It seems probable, however, that both cabbages and turnips may be set out too thin, as the increase of size is not always equal to that of number.

It is the practice of some districts, where this culture is well performed, to set them out regularly, at the distance of three feet each way, as in this method the plough in cleaning and earthing up the crops can be conducted both in a longitudinal and cross direction, and of course the soil between the plants be not only stirred in the most effectual manner, but the most completely laid up to the roots of the plants, and their growth the most fully promoted. Where the larger varieties of cabbage are employed, and the land is sufficiently strong, this may

\* Miller's Dictionary, art. *Brassica*; and Young's Annals.



therefore in general be the most advantageous distance; but where the smaller varieties are made use of, and the ground is of a less strong and rich quality, two feet and a half may be the most proper and beneficial distance. Other cultivators, however, follow a different practice; some preferring four feet by two feet and a half, while others advise only two feet by twenty inches, or even eighteen inches. In these distances the cabbages are, however, under the necessity of being hand-hoed between the plants in the rows; the intervals only being cleaned by the plough\*. The culture cannot, of course, be by any means so perfectly performed; the soil in the former method being wholly removed except the small portions immediately about the roots of the plants, while in these, much of it must remain untouched, and be not only left in a more foul condition for succeeding crops, but less beneficial in promoting the growth of the cabbages†.

But whatever distances may be thought the most advantageous, it will constantly be necessary to attend to the manner of setting them out, the size of the plants, and the mode of taking them up from the seed-beds, as much depends upon these operations being properly performed. In setting the plants out, in the ridge method, it is necessary to have them placed in lines as regularly as possible, according to the distances employed, along the middle or crown of the ridges, immediately upon the part in which the manure has been inclosed; as by having this accomplished in an accurate manner, they not only admit of being cultivated betwixt with more ease and convenience, but derive the utmost

\* Marshall's Rural Economy of the Midland Counties, vol. I. p. 211; and Young's Eastern Tour, vol. IV.

† The experiments and observations of Mr. Baker, in the cultivation of cabbages in the field, led him to recommend the following as the most suitable distances for the different varieties which he employed.

| Varieties.         | Season.       | Distances.                           |
|--------------------|---------------|--------------------------------------|
| Long-sided Cabbage | Winter Plants | 2 feet by 4, or 18 inches by 4 feet. |
| Flat Dutch Cabbage | do. do.       | do. by do. or do. by do.             |
| Scotch Cabbage     | do. do.       | do. by do. or do. by do.             |
| Flat Dutch Cabbage | Spring Plants | 18 inches by 4 feet                  |
| Scotch Cabbage     | do. do.       | do. by do.                           |
| Turnip Cabbage     | do. do.       | 1 foot by do.                        |

The nature of the soils on which they were cultivated is not described.

For all the larger sorts of cabbages on the different sorts of strong rich soils, the most advantageous distances may be three feet each way; and on the more light soils two feet and a half.

But for the smaller sorts two feet each way on the strong soils, and eighteen or twenty inches in such as are light.



possible advantage from the manure, and at the same time, from its being more concentrated, require a smaller proportion to be employed.

The size of the plants is likewise a circumstance of much consequence, as the large stout plants not only take root with more certainty, but are less exposed to danger from slugs and other causes\*. In removing the plants from the seed or other bed, for the purpose of being planted out, it is also of much utility to have their roots as little broken or otherwise injured as possible. Moist or rainy weather is the most suitable for this operation; but in dry seasons it may be well accomplished after the plants in the beds have been well watered. The number of plants that are employed must obviously be different, according to the distances at which they are planted; but from five to seven thousand are generally sufficient for an acre of land.

In setting the young plants out into the ground, it is necessary to see that the labourers fix them well in the soil, by applying the mold so firmly round their roots by means of the dibble, that they cannot be easily drawn out by taking hold of their uppermost leaves. The plants are mostly dropped at proper distances, by women or children, and the dibblers follow, having a stick for marking the distances with in an exact manner. In this way an ordinary labourer will plant a quarter of an acre or more in a day, and an expert gardener nearly as much more. In the course of a fortnight or three weeks after the first setting out of the plants, it will be requisite to fill up all the vacancies that have been produced by the failure of particular plants; in performing which a moist time, if it be possible, should be chosen.

The expence of planting out, as well as of all the other operations in crops of this sort, must be liable to vary greatly, according to the circumstances of the soil, and the situation in respect to labourers. In Suffolk, according to the writer of the *Corrected Report of the Agriculture of that district*, it is in general about three shillings the acre; but in other places it is frequently a little higher, the whole charge of an acre being estimated as shewn below†.

\* *Corrected Report of Suffolk.*

† *Expences of Cabbage Culture on one Acre.*

|                  | £. | s. | d. |
|------------------|----|----|----|
| Charges for Rent | —  | —  | —  |
| Tythes           | —  | 0  | 10 |
| Poor rates       | —  | 0  | 1  |
|                  |    |    | 6  |
|                  |    | 0  | 1  |
|                  |    |    | 3  |
| Carried forward  | £. | 0  | 12 |
|                  |    |    | 9  |
| Ploughing        |    |    |    |



*After-Culture.*—There is scarcely any sort of crop that derives more advantage from having the mold or soil frequently stirred and applied to the roots of the plants, than that of the cabbage. It is only by a due repetition of these operations that the plants attain their most perfect growth and size. The work is accomplished by means of ploughs, horse and hand-hoes. Where the plants are set out in a regular manner at sufficient distances, the business may be performed in the most cheap and effectual way by the use of the horse-hoe, or the common light swing-plough; but where narrow distances are employed, this work can only be well executed by means of the hand-hoe. Sometimes both the horse and the hand hoe are made use of; as where the crop is planted close in the rows, with wide intervals. The number of hoeings must in general depend upon the state of the land and the nature of the season; but three will in most cases be necessary. The first should be given about three weeks or a month after planting, according to the growth of the plants; and the second at about an equal distance of time. The third may be repeated as the necessity of the crop may require, attention being constantly paid to keep the land perfectly clean from weeds, and the earth or mold well loosened and laid up to the plants. In the first operation it is usual to turn the mold or soil from the plants, but in the subsequent ones to apply it up to them, which, where the plants are set regularly in squares at the distance of three feet, may be performed in both directions of the ground, in the most perfect manner. In this way the cultivator not only in a great measure avoids the heavy expence of hand-

|                                          | £.   | s. | d. |
|------------------------------------------|------|----|----|
| Brought over                             | 0    | 12 | 9  |
| Charges for Ploughing land five times    | 1    | 0  | 0  |
| Harrowing twice                          | 0    | 0  | 6  |
| Manuring                                 | 2    | 0  | 0  |
| Seed-bed and seed, &c.                   | 0    | 1  | 6  |
| Planting out                             | 0    | 3  | 0  |
| Filling up deficiencies                  | 0    | 0  | 6  |
| Hand-hoeings                             | 0    | 4  | 0  |
| Horse work in hoeing                     | 0    | 4  | 0  |
| Cutting and cartage one-fourth of a mile | 0    | 15 | 0  |
|                                          | £. 5 | 1  | 3  |

In this estimate, the whole of the expence of manure is, it is observed, charged to the cabbage-crop; but the advantage ought properly to be divided, which would lessen the expence considerably.



hoeing, but contributes to the growth of the crop in the most effectual manner. In executing the work, by means of horse labour, some make use of the horse-hoe, others the double mold-boarded and common hoe ploughs; and it has been contended, that it may be effected with equal exactness and in an equally effectual manner by any common light swing-plough\*.

After these hoeings have been accomplished, the hand-hoe may be occasionally employed just about the roots of the plants, if there should be necessity. And where the crops are planted out at narrow distances either wholly or in the rows only, it must altogether or in a great degree be depended upon for the after-culture of the crops. In these cases, two or three hoeings are mostly found necessary†. The expence of each hand-hoeing in such crops is in general from two shillings to half-a-crown or three shillings the acre‡.

Cabbage as well as turnip crops are liable to be injured by the attacks of animals of the insect kind at different periods of their growth. While the plants are young and tender in the seed-bed, the *beetle* or *fly* often greatly injures or destroys them by its ravages. The plants likewise occasionally suffer in the seed-bed from the attacks of the *caterpillar*, produced by the cabbage butterfly§, though less frequently, as this insect makes its appearance in general too late to do much injury to field crops.

The *slug* sometimes also does much harm to cabbage plants while young, and on their being first planted out, but afterwards they are little exposed to its attacks. The depredations of the fly or beetle, as well as the caterpillar, may in general be in a great measure prevented by the sowing or dispersing of wood-ashes, foot, or other similar matters in a powdery state, over the young plants on the first appearance of the insects among them. And the ravages of the slug may be guarded against by the means that have already been recommended for turnips.

But besides the attacks of insects on the leaves of the plants, cabbages are subject to a disease in the roots, in which they become swelled out and knobby, and the plants weak and of imperfect growth. This vegetable disease has been supposed to be caused by the attacks of grubs below the surface of the ground, and to be chiefly prevalent where the same sort of cabbages are sown and planted on the same spots of ground for several years together||.

\* Anderson's Recreations in Agriculture, &c. vol. II.

† See Hoeing.

‡ Corrected Report of Suffolk.

§ *Papilio Brassicae*.

|| Stokes, in Withering's Botanical Arrangements.



When care is taken to plant out the proper hardy sorts of cattle cabbages there is little danger of their being injured by the severity of the frosts during the winter months, as seldom more than a few of their large outside leaves have been found to suffer. Many of the hardy varieties of cabbage have indeed been found to stand the winter frosts equally, or even better, where there are frequent thaws, than those of the borecole or kale kinds; but the latter would appear better adapted as a green food, especially for sheep, in the early spring months, as it may be repeatedly eaten down or cut over\*.

It is scarcely possible to ascertain the quantity of produce that may be derived from an acre of land under a crop of this kind, as it must depend in a great degree upon the quality of the soil, the proportion of manure that is employed, the method of culture, the goodness of the plants, and the favourableness of the season about the time of planting them out. It may probably in general be estimated at from twenty to thirty tons. In comparing the produce of cabbage crops with those of turnips, in different modes of planting and on different kinds of soil, it was found, taking the best parts of the crops, that a medium acre of the former, on good land, well managed, produced twenty-five tons, and of the latter fifteen tons†.

The value of the crops must likewise be affected by various circumstances, as the kinds of live stock by which they are consumed, the manner in which it is accomplished, and the situation of the cultivator in respect to markets; but in common they may be calculated at from four or five to seven or ten pounds the acre.

In the application or expenditure of cabbage crops, as they are often liable to a considerable diminution in the quantity or weight of food which they contain, by standing over the winter to the spring months, it may be the best and most economical practice to make use of them late in the autumn, while their leaves are in perfection, in completing the fattening of such neat cattle or sheep as have been brought considerably forward in the pastures during the summer season‡. In this way there is much less loss sustained than is generally the case where they are suffered to stand for spring feed, by the decay and destruction of the outside leaves and other parts of the plants. In the feeding of milch-cows at the same period they may likewise be of very great utility, as supplying a large proportion of green food, whether the whole plant be made

\* Modern Agriculture, vol. II.

† Young's Annals, vol. XII.

‡ Young's Eastern Tour, vol. IV.



use of, or only the more loose green leaves, which may often be removed without much injury to the cabbages\*. In this method of application they have been shewn to be more beneficial than hay, given in any proportion, when only combined with straw; and that the butter is not in any way injured by them while they are given in a sound state†. When employed in this way without any combination of other sorts of food, as hay or straw, an acre has been found to be sufficient for four or five cows, and with straw and a little hay for seven or eight‡. In this mode of consuming cabbage crops, the cows should always be confined to the farm-yards, and not suffered to eat them after being scattered on the ground; as in the latter way the farmer must sustain injury, both in the treading of his lands and in the loss of a large portion of valuable manure. Besides, we suspect that such sort of food will go much farther when carefully applied in the yard, than when consumed on the land, as much waste must be unavoidable in the latter method||.

In the fattening of neat cattle, an acre of good cabbages may be nearly sufficient for three beasts of from forty to fifty stone each which have been grazed in the pastures during the summer. A middle-sized bullock consumes, in general, of this sort of food, in the proportion of about one hundred pounds in twelve hours; but much in this business must constantly depend on the state of the stomach and the methods of feeding the animals. It would, however, seem probable, that cabbages possess the property of fattening cattle, not only more expeditiously but in less proportion than turnips; an acre of the former having been found to fatten one in four more than the same extent of the latter crop§.

In feeding this crop off with sheep it has been observed, that such as weigh about twenty pounds the quarter consume in the proportion of from eight to ten pounds in twelve hours, half an acre being nearly sufficient for one hundred sheep when the crop is good. The cabbages, when run to seed in the spring months, are also consumed with avidity by these animals; but this practice should never be attempted, as much injury must always be sustained by the land. The refuse of cabbage crops may, however, sometimes be usefully applied in the more early spring months, before they begin to run, to the feeding of lambing ewes, as by such means the quantity of milk is much increased, and the lambs of course better supported¶.

\* Corrected Report of Suffolk.

† Farmer's Magazine, vol. III.

‡ Bath Papers.

|| Corrected Report of Suffolk.

§ Bath Papers.

¶ Forby in Annals of Agriculture.



Store hogs are likewise said to be kept upon this vegetable with advantage, and to prefer it to turnips. In the trials that we have been enabled to make with the finer breeds of this sort of animals, we have not, however, found it a beneficial mode of applying such crops, as they constantly reject both the cabbage and turnip for most other sorts of food, and, unless prepared by heat, seldom eat them up clean.

Though few experiments have been made in the feeding of horses with this sort of food, it is probable that, after being chopped, cut, or shaved down by means of a stock or other knife, and blended with some sort of dry cut fodder, it might be employed with great advantage both in the saving of other more valuable kinds of food and in promoting the condition of the animals; as, from their containing much saccharine matter, there can be little doubt of their possessing a highly nutritious quality. In this use, the more sweet and delicate sorts of cabbage ought probably to be preferred. That the application of this sort of crop in this way has been scarcely attended to is fully shewn by the observation of Mr. Marshall, in his account of the midland districts, who registers it as extraordinary, that neither in that nor any other district an instance had been met with of cabbages being made use of in the way of food for horses.

Where cabbages are employed for winter and early spring consumption, it has been advised by some cultivators to have them cut or drawn while in full perfection, and piled up in houses for the purpose, or stacked in the open air, being closely covered over by means of straw, broom, rushes, or any other similar cheap material; as in this way they are constantly ready and at hand, when they cannot be procured from the field, on account of the wetness of the land or the effects of frost and snow\*. The practice is said to have been made use of in Germany with such success as to keep them in a good state of preservation during the whole of the winter season. From the sweet juicy nature of the vegetable, we are, however, disposed to believe that it will be liable, in this method, to be injured, not only by taking on too much heat, but by becoming mouldy. Besides, by keeping in such stacks they, like the turnip, shrink considerably, and are probably much impaired in their quality.

In whatever manner cabbages are consumed, it is of importance to the succeeding crops that they be wholly removed from the land in the early part of

\* *Farmer's Magazine*, vol. III.



the spring, before they begin to throw up their flowering stems and run to feed.

On the whole, as cabbages may be cultivated at no great expence, are much less exposed to danger, and capable of resisting the severity of the winter season more effectually, than turnips, and at the same time become equally palatable and nutritious to various kinds of animals, there cannot be any doubt but that they may be had recourse to with great advantage in such soils and situations as are not adapted to the turnip husbandry, and especially wherever a large proportion of green food is wanted for the support of milch-cows in autumn and winter.

It has indeed been suggested by a late writer, that in cases where turnip crops have either wholly or in part failed, and the soils are of an ordinary depth, the lands may be recropped with cabbages at a cheap rate, and with the greatest chance of success\*. This may, therefore, be a point that deserves the notice of the extensive turnip cultivator on all the stronger kinds of turnip land.

The evidence that has been laid before the public by the intelligent writer of the Corrected Report of the State of Agriculture in the County of Suffolk seems to demonstrate, that crops of this kind become injurious to the land both in their growth and the removal of the produce; and that the objections to their culture have chiefly been raised on these grounds. It appears probable, however, that, if the circumstances of the quantity of produce in cabbage-crops being, in general, considerably larger than in those of turnips, and that part of their deteriorating effects depends on the stalks or stems being improperly left in the ground till they sprout afresh, and by that means lessen the fertility of the soil, as well as that of their being removed from the ground with more convenience and less injury to the land, from the nature of the ridges on which they are planted, be duly considered, they will not be found to impoverish the land on which they are grown, in any very great degree, more than those of the turnip kind. The trials of different cultivators are likewise in favour of the same conclusion†. They may of course be considered as a proper and beneficial crop for all those sorts of land that are too strong and retentive of moisture for the successful growth of the common turnip, especially where dairy husbandry is practised to any extent.

\* Modern Agriculture, vol. II. † Forby, in Annals of Agriculture, vol. XIX, &c.



*Turnip Cabbage.*—This is a plant that has been long known to the horticulturist, and which was attempted to be introduced into field culture many years ago, but without complete success, notwithstanding the results of the experiments that were then made upon it appear to have been much in its favour\*. In this variety of the cabbage the bulb or apple is of a roundish flat form, appears principally above the surface of the ground, and is as it were an enlargement of the stem of the plant, the leaves that surround it having much resemblance to those of brocoli. It has sometimes been cultivated under the title of *Cape Cabbage*, and often confounded with the *Turnip-rooted Cabbage* by those cultivators who have not sufficiently attended to the circumstances by which they are distinguished†. It seems to be the plant cultivated in many parts of Germany under the title of *Kohlrabi*, and which is said to be extremely hardy.

The soils that are the most adapted to the growth of this plant are those of the more light and dry kinds, that have some degree of elevation in respect to situation, and which are in a good state of fertility from previous tillage.

The land is to be prepared by ploughing three or four times, in nearly the same manner as for the common turnip; being laid up in the autumn, in order to be rendered fine and mellow by the action of the frosts and other causes during the winter. After being thus well prepared, at the time of planting it is to be ploughed into small two-bout ridges, and a suitable proportion of manure, according to the state of the soil, turned in. On the ridges, when flatted by a light roller, the plants are to be set out.

*Seed, and Time of Sowing.*—In collecting the seed, the same method should be pursued as has been advised for cabbages, in order that no adulteration may take place. In cultivating this plant, the seed is sometimes sown in beds in the fields, whence the plants are afterwards to be set out, and at others in drills or broadcast, where the plants are to remain, being only thinned out to proper distances by the hoe. The first method is probably in general to be preferred, though some cultivators contend that the plants succeed better when not removed from the places in which they were deposited when sown. Where the transplanting method is practised, the seed should be sown sufficiently early to have the plants of a proper size, as of about six or seven weeks' growth, at the time of transplanting. About the middle of March or beginning of April may be the properest periods. The seed in these cases should be sown very

\* Transactions of Society of Arts, &c.

† Bath Papers, vol. IX.



thin, and the weak plants afterwards thinned out, till they are left at not less than three inches distance from each other. Five or six ounces of seed will in general be a proportion sufficient for affording plants for setting out an acre of ground. In the drill method the same proportion of seed may also in common be sufficient, which should be put into the soil about the beginning or middle of April; but if sown later, as in May or June, it frequently succeeds. On the broadcast plan, from the plants not coming quickly to the hoe, the latter end of March may probably be the most suitable period of sowing. In this method, the proportion of seed must be somewhat increased.

*Method of Planting.*—Crops of this sort may be planted out either upon the plain surface of the ploughed ground, or after it has been thrown up into ridges in the manner described above; but the latter is by much the best method, especially where the land is not perfectly dry. The most eligible time of performing the business of planting is, as in the common cabbage, when the land has had a good shower of rain; the operations of ploughing and setting out the plants proceeding together: but neither operation should be attempted when the land is much soaked with rain, as much injury is not only done to the land, but the plants seldom thrive well\*. In planting out different distances are practised, some preferring the distance of two feet from row to row, and eighteen inches apart in the rows where the soils are good, but in those of inferior quality not more than twelve†; while others advise their being planted two and a half or three feet asunder, on two-bout ridges‡, the plants being placed as nearly as possible in the middle, immediately upon the dung, as has been recommended for cabbages.

*After-Culture.*—This business must be performed in different ways, according to the methods of sowing or planting that have been practised. When the seed is put in by the hand, the crop can only be kept clean by means of the hand-hoe, which should be applied as frequently as is necessary for the purpose.

In the drill mode, as well as where the crop is planted out with broad intervals and narrow distances in the rows, it may be convenient to make use of both the plough or horse-hoe and the hand-hoe, employing the former in stirring and clearing the intervals, and the latter in keeping the ground between the plants clean. When the crop is planted on ridges, it is recommended, that as soon as the

\* Bath Papers, vol. IX.

† Miller's Dictionary, art. *Brassica*.

‡ Bath Papers, vol. IX.



plants have become firmly established in the soil, and weeds begin to appear, to throw a furrow from each side of them by means of a small plough that is narrow behind, stirring the parts not thus moved by the hand-hoe, and after the decay of the weeds thus turned down, but before the plants get too large, to return them to their former situation, care being taken not to cover the hearts of the plants with the earth. These operations may be repeated as frequently as the state of the crop may require.

It may be necessary to observe, that in the after-culture of this plant, as it forms its bulb above the surface of the ground, the earth or mold should never be laid up so much to the roots of the plants as in the common cabbage, as it may contribute not only to prevent the swelling of the bulbs, but promote their destruction.

In dry seasons this plant may probably be cultivated with greater advantage than that of the turnip, as not being subject to the destructive attacks of the fly, and being less exposed to danger from other animals that are liable to destroy crops of that sort. When situated close to turnips that have been almost wholly devoured by the fly, we have never perceived that plants of this kind were in the least touched by it.

In good ground the bulbs or roots of these plants frequently attain a considerable size, the largest sometimes weighing eight or ten pounds, and are said to be much more hardy than the common turnip, though not so much so as the *turnip-rooted cabbage*. The quantity of produce on the acre is not probably in general equal to that of the common turnip.

Its application is chiefly in the feeding of neat cattle and sheep, during the autumn or spring months, according as it may be sown more early or late; but the most profitable consumption of it is probably in the latter season, as from the middle of March till it is removed from the ground. In this way it may become an useful assistant to crops of the turnip kind. For this use it possesses a particular advantage, in being formed, as it were, upon a foot-stalk above the surface of the earth; as it can on that account be more conveniently got at and removed during the time of frost, or when snow is upon the ground, than the common turnip. The proportion of nutritious matter contained in crops of this sort is considerable, and of a rich quality. Cows thrive extremely well on this food, when it is given them in a judicious manner. When fed off by sheep, the best method is that of hurdling, in the manner practised for common turnips. In this mode of application they are said to require little or no hay, even where the intention is to fatten the animals, as they make a greater progress with



them than on any other sort of food, except that of oats. Both cows and sheep have been found to feed upon the sprouts with avidity, after their having bloomed and been cut and left to wither. But this practice should seldom or never be attempted, as much injury must constantly be done to the land by the plants being suffered to run to seed. After the bulbs are shrunk and withered from being cut and packed up in houses, they are said to form a nutritious food for horses.

Instead of cutting off the bulbs below the parts where they are formed, in order to preserve them in houses for the above purpose, it is the practice of some cultivators to plough them up wholly, using a common plough, without any coulter, having only a round share with a blunt edge, for the purpose \*. This is passed along under the rows, and performs the work with much ease and expedition.

*Turnip-rooted Cabbage.*—This is another plant of the cabbage kind that has been introduced into field-culture with considerable success. It differs principally from the former in forming its bulb or protuberance below the surface of the ground, in having it of an oblong shape, and in the leaves having a considerable similarity to those of the common turnip.

The most suitable soils for the growth of this sort of vegetable are those of the more friable loamy kinds, or such as have been formed by the gradual deposition of earthy matters from the overflowings of large rivers or the sea. But of whatever kind the soil may be, the particles of it should have been well broken down and reduced by means of tillage, and not be too retentive of moisture, when plants of this sort are cultivated upon it.

In preparing the land for the crop it will therefore be necessary to have it brought into a considerable state of pulverisation or fineness, by repeated ploughings, and the passing of harrows over it; and also enriched by the application of manure, in the proportion of eight or ten waggon loads to the statute acre, which should be turned in with the last ploughing in forming the one-bout ridges for the reception of the plants. This is sometimes performed by the common plough, but it may probably be executed with more exactness by one with a double mold-board.

*Seed.*—This is to be constantly collected from the best and most perfect plants of the kind, in the manner that has been already directed for the common cabbage. It should likewise be employed while it is perfectly fresh, as

\* Young's Annals of Agriculture.



such seed as has been kept for some length of time seldom comes up well, or with much regularity. But where it is necessary to make use of it, the best method is to steep it in water for a few hours before it is sown.

*Time of Sowing.*—This is to be performed sooner or later, according to the intentions of the cultivator in respect to the consumption of the crop; but for the summer planting, the best time may be about the latter end of March or beginning of April. For this purpose a piece of ground should be prepared by repeated turning over during the winter, so as to become perfectly fine and free from weeds. This must now be covered over by some well-reduced farm-yard manure, adding a little fresh horse-dung from the stable. This is then to be turned lightly in by means of the spade or plough, and a suitable proportion of seed sown over the whole, being covered in by means of a strong rake or light harrow\*. As the plants rise, attention is to be paid to the fly, guarding against its attacks by the use of wood-ashes or soot, when it first appears.

When the plants are found to grow too fast or advance too high in the stems before the period of setting them out in the field, so as to attain an improper shape not easily afterwards removed, it may be necessary to draw up the whole of the plants clean on one side of the bed, digging or turning the soil over in the place where they stood, to the depth of four or five inches, with the spade, putting the plants in the trenches in the proportion of forty or fifty in each yard, the roots being covered by the earth taken out of the succeeding trench, and slightly trodden down upon them. In this manner the whole of the plants that require it are to be entrenched; by which their improper growth may not only be checked, but the plants be rendered more fit to be set out in the field. Where the land for the seed-bed has, however, been properly prepared, and is perfectly freed from weeds, this process will seldom be found requisite†.

*Method of Planting.*—This sort of plants may be set out in the same manner as the turnip cabbage, either upon the plain ploughed surface, or after the land has been raised into ridges, in the way described above. The latter is, however, to be preferred, especially where the soil is inclined to be moist. They are planted at different distances, according to the goodness of the land; but

\* Where this sort of preparation has not been made, a piece of old grass-land, reduced by paring and burning, may (Mr. Tugwell, an experienced cultivator, observes) be dressed in a similar manner; or the subsoil of a winter sheep-fold, the straw, dung, and thin turfy material, having been previously removed.

† Tugwell in Bath Papers, vol. IX.



the most general practice is from two to two and a half or three feet. In the ridge method it is usual to set them on the middle of the ridges, at the distance of two feet in the rows. The plants are to be carefully drawn from the seed-bed towards the latter end of June, for the summer planting, when of the size of good large cabbage-plants. And in order that as little injury as possible may be done to their roots, this business should be performed immediately after rain, or after the beds have been well watered. They are then to be made up into small bundles, and distributed by women or children singly along the ridges, or on the plain surface of the land, at proper distances, to be directly put into the soil by the dibblers; in doing which, they should be plunged up to the place of the branching out of the leaf stems, the mold or soil being firmly closed about them in the manner recommended for the common cabbage plants. It is particularly necessary to attend to this last operation in dry seasons, as the success of the crop in a great measure depends upon its being properly performed\*.

Care should likewise be taken that a greater number of plants be not drawn from the seed-bed than can be planted out the same day, and that they be as little as possible exposed to the action of the sun and wind. It is also necessary for a few days to guard against their being pulled up by rooks or other birds.

*After-Culture.*—This is to be carefully attended to here, as well as in all other crops of a similar kind. In about ten days or a fortnight, when the plants grow well, they will in general require the assistance of the hand-hoe, to clear the ridges and give the plants a slight dressing. And as soon afterwards as may be convenient, the intervals may be cleared either by the common plough or any other more suitable implement, by passing them twice along each, turning the furrows, where the land is clean and not too close or compact, up towards the rows, being careful not to earth up the plants to too great a height; but where the contrary is the case, they should be turned from them, so as to form a ridge in the middle of the interval, the implement being passed within a few inches of the plants in performing the operation. This ridge in dry seasons should be split down and returned to the rows again in the course of a few days; another hand-hoeing being given as soon afterwards as may be found convenient. This last operation may frequently be unnecessary on the more light and clean descriptions of land; but on the strong and more compact soils

\* Bath Papers, vol. IX. XI. *Turnip in Bath Papers, vol. IX. XI.*



it may be had recourse to with advantage, both in respect to the present and future crop, so as to compensate any expence that may attend it.

The produce in crops of this kind is frequently found, on good land, to be from twenty-five to thirty tons on the acre. In a practice of twenty years, the produce of an acre of this crop was on an average invariably found to be equal to the support of seventy sheep for a month, in the most hungry, trying, and difficult part of the year: and this on land then not worth more than thirteen shillings the acre, but which contained between seven and eight thousand plants, averaging above four pounds each in weight\*.

As the plant is a native of a more cold and northern climate, it of course retains in some measure the late habits of the situation from which it was originally brought, and becomes proper for the purposes of feeding live stock at a later period in the spring than many other plants to which it has a resemblance. It is seldom before the middle of April that the juice begins to rise and the plant become proper for being fed upon. About this time, however, as is shewn by the bulky appearance of its top, it begins to push forward and be in a condition to be made use of. When employed before this period, it is said to be comparatively of little advantage, and in some cases even injurious to the animals that feed upon it†.

Its principal application is in the feeding of sheep, which animals are confined upon portions of the crop by hurdles, in the manner practised for the common turnip. The roots are, however, to be pulled up and prepared by being cut in two by means of an implement of the mattock kind, having a claw on one side nine inches long, with a transverse edge at its end two inches in width, and on the other a sort of cleaver; with this tool, acting as a lever by means of the handle, the roots are readily taken up; after which any dirt that may adhere to them is shaken off by a blow or two, and the roots split by the cleaver. By this means the sheep begin in the centre of the roots and proceed outwards, eating them with more ease and much more completely than in any other method. When they are not cut, the hard substance of the rind renders them difficult of being eaten by these animals‡. One-year-old sheep, or what are frequently denominated *tegs*, wethers, and all dry sheep, may in preference be fed on this root; but when ewes and lambs are to be kept upon it, the hurdles must be so contrived as to admit the lambs to pass through

\* Bath Papers, vol. IX.

† Ibid. p. 271.

‡ Ibid.



them to feed at large, as by this means both they and the roots will be much benefited\*.

This root may be found on the whole, from its hardy and other properties, to constitute an excellent nutritious food for sheep at those periods in the spring when few other sorts of green food can be procured or depended upon. The culture of it, in proportion to the quantity of sheep that may be kept on the farm, should not therefore be neglected.

This vegetable has been asserted to be capable of being preserved for some time out of the ground, without its properties being in the least injured; but as in most other bulbous roots, the best and most economical practice is probably that of employing it in its fresh state. When thus made use of, there can be little doubt of its proving a valuable assistant to the turnip crop as a late spring feed for sheep.

*Rape or Cole.*—This is a plant of the cabbage kind†, but which differs from it in not forming a close head. As being of a hardy nature, and affording a large proportion of green food for the winter support of sheep and other animals, it has been some time introduced as an article of field culture. It has likewise been cultivated for a considerable length of time for the use of the seed, which is expressed in mills constructed for the purpose, in order to form the oil known by its name.

The soils most adapted to the culture of this plant are those of the deep and more fertile kinds: when it is grown on lands that have been long in tillage, the friable loamy kinds are found to answer the best; but it may be grown with perfect success on the fenny, marshy, and other coarse waste lands, that have been long in the state of grass, after being broken up and reduced into a proper state of preparation. As a first crop on such descriptions of land it is often the best that can be employed. When sown on old tillage lands, the method of preparation is pretty much the same as that which has been given for the common turnip; the land being ploughed over four or five times, according to the condition it may be in, a fine state of pulverisation or tilth being requisite for the perfect growth of the crop. In this view the first ploughing is mostly given in the autumn, in order that the soil may be exposed to the influence of the atmosphere till the early part of the spring, when it should be again turned over twice, at proper distances from each other; and towards the begin-

\* Bath Papers, vol. IX.

† *Brassica napus*.



ning and middle of June one or two additional ploughings should be performed upon it, in order that it may be in a fine mellow condition for the reception of the seed.

But if the seed be intended to be put in upon lands that are newly broken up from the state of sward, they must be rendered perfectly clean and in a sufficiently fine state of mold for the reception of the seed, either by frequent ploughing in the common way, and afterwards harrowing the surface well by light short-tined harrows; or by having recourse to the practice of paring and burning, which may be performed in the manner already described \*. The last is by much the most effectual, cheap, and advantageous method, where the surface contains a large quantity of coarse grassy matter, as it can scarcely be reduced by any other means without much time and trouble. This is the sort of preparation that is generally employed when the crop is intended to stand for seed †.

If sown on the first sort of preparation, it is the best practice for it to succeed wheat or barley crops. When the former, barley or oats, with grass-seeds, may be put in after it; but if the latter, it may be succeeded to the greatest advantage by wheat, as it is found to be not only an excellent preparation for that sort of grain, but to afford it of the finest quality; and by its being taken off early there is sufficient time allowed for getting the land in order for the wheat crop ‡. Where the tillage land is not in a good state of fertility, manure of the same kind and in the same proportion as for turnips should be applied and turned in with the last ploughing for the seed.

*Seed.*—For this crop such seed as has been perfectly ripened, is quite fresh, and has a fine black colour, is constantly to be preferred, as vegetating in the most perfect and expeditious manner. The quantity of seed that is made use of is in general from a quarter to half a peck, according to the manner of sowing that may be practised. Where the crop is intended to be consumed as a green food for animals, a larger proportion of seed may, however, be necessary than where the obtaining of seed is the chief object of the cultivator.

*Method of sowing.*—The most common practice in putting this crop into the ground is that of dispersing it in as regular a manner as possible over the surface of the ground by the hand, covering it by means of a bush or other light harrow. Instead of this it is, however, sometimes ploughed in when cultivated on the more light and open kinds of soil, a larger proportion of seed

\* Section on Paring and Burning.

† Modern Agriculture, vol. II.

‡ Kent's Hints.



being allowed, and the furrows made narrow with but little depth. In such cases this has been suggested as preferable to the former method\*.

The drill method has also been practised with this crop, the seed being deposited to the depth of one inch in rows on every other land, twelve inches asunder. The superiority of this mode over that of the broadcast appears considerable in the statements that have been made of it, as the land is capable of being kept clean with less difficulty and expence†.

It has been suggested likewise as a desirable method to sow the seed in beds, for the purpose of being afterwards transplanted into the field and set out in the manner of cabbage-plants. Half a rood of land in this way would be sufficient to furnish plants for five or six acres. In this manner, as well as by pulling the plants from the places where they may stand too close in the field, the vacancies that frequently occur in this sort of crop may be filled up, the work being performed by dibbles‡. And even the transplanting the whole crops by beginning at one side of the field, and proceeding gradually, from one land to another, till the whole is finished, would, it is believed, be highly advantageous; as in this way the land would be provided with the best plants, and such as are of equal size; and by their being placed at regular distances, the crops would ripen in a more equal manner, while at the same time free admission would be given to the hoe, and the intervals be kept clean by narrow horse-hoes||.

This business may be performed about the beginning of September or October, according to circumstances. For this purpose the plough is made use of, the plants being placed by women in a leaning position in every second furrow about a foot apart, and the roots covered by the next furrow; after which another is added, and more plants placed in as before, proceeding in the same manner till the whole is finished. The plants of course stand at about the distance of eighteen or twenty inches by twelve. Where land that has been pared or burned is managed in this way, the first or seed-ploughing should be in a cross direction, and that for transplanting lengthways, in order to render the land dry in winter.

These methods appear better adapted for such crops as are designed for seed than for those intended as green food for live stock; as by the perfect culture that

\* Kent's Hints.

† Amos on Drill Husbandry.

‡ Marshall, in Rural Economy of Yorkshire.

|| Ibid.



may be thus given them, and the use of manure, the inconveniences attending the feeding of rape crops may perhaps in a great measure be obviated.

When cultivated for use as green food, the seed should probably be sown more early than where the crop is to stand for feed, or be employed in both ways; but sufficiently early to get a strong leaf without running to stem the first autumn\*. The middle of June and the last week in July may be the most proper periods.

*After-Culture.*—In the general broadcast method of cultivating this crop, proper attention in hoeing and keeping it clean from weeds is seldom bestowed, though it is equally necessary as in almost any other, and in order to ensure a full and abundant produce ought never to be omitted. Where this business is attended to, it is the practice, after the plants have attained two or three inches in height, put out six leaves, and begun to spread and shew themselves perfectly above the ground, to hoe them over by means of a hand-hoe somewhat smaller than that employed for turnip crops, setting the plants out to the distances of from six to eight or nine inches from each other, according to their vigour or strength and the fertility of the soil. This is the only hoeing that is in general given; but in many cases, as where the land is poor and disposed to throw up weeds, much advantage may be derived from a repetition of the operation, not only in cleaning the ground, but promoting the growth of the plants, by stirring the mold round them. This should be done about a month or five weeks after the first hoeing. The expence of performing the work once, is mostly about six or seven shillings the acre.

But in the row methods, whether by drilling the seed or transplanting the young plants, the business of hoeing may be performed in a more perfect and cheap manner, on account of the greater distances of the plants admitting the earth in the intervals to be stirred by the plough or horse-hoe, while hand-labour becomes only necessary between them in the rows. In this way a garden cleanliness may be preserved in such field crops at no great expence.

When the produce is intended to be consumed as green food, the crop will in general be sufficiently advanced for the purpose, if there should be a necessity for it, towards the latter end of November; but, except where the feed is to be afterwards taken, it is probably a much better practice to reserve it as feed in the spring months. When cut or fed down in the autumn, the plants mostly

\* Miller's Dictionary.



advance so in the spring as to form a second crop in April. But in this method of feeding off the crop care should be taken that the plants are not pulled up and destroyed by the animals being confined too long upon them.

If the intention be to let crops of this sort stand for feed, without feeding them down in the autumn, which is a practice often adopted; after they have been well cleaned by hoeing, nothing further is necessary till the latter end of June or beginning of July, when the seed becomes ripe. This is shewn by the pods putting on a brownish appearance, and the seeds in the forwardest of them turning a little black. This should be nicely attended to, as, if suffered to remain too long uncut, much seed may be lost. They are usually reaped with the sickle and laid in thin *grips* or *reaps* upon the place where they grow, until they be in a proper condition for threshing. This is known by the straw becoming of a whitish colour, and the seed appearing perfectly black. If however they remain upon the ground too long, much of the best seed may be lost, and if threshed in too green a state, much may be left in the pods, as well as what is threshed out be difficult to cure or preserve\*.

In these cases, the seed is threshed out in the field upon cloths about twenty yards square laid upon the ground, or what is better, upon wattled hurdles, so placed as to have an inclining direction, cloths being placed underneath to secure the seed. The rape is conveyed to the place by means of sledges, the bottoms and sides of which are lined with cloth in order to preserve the seed that may escape in the operation. It is sometimes likewise cleaned in the field, and put into sacks for the market†. When large quantities of seed are brought quickly together, as they are liable to heat and become mouldy, it may be a better method to spread them out thinly over a barn, granary, or other floor, and turn them as often as may be necessary.

In some parts of Yorkshire this business formerly constituted a sort of festival‡; but it is now much on the decline, the method of binding the crop in small sheaves and stacking it in the field being much adopted. The barn ought, however, to be preferred.

The expences of the different operations, such as reaping, turning, threshing, dressing, and depositing the seed in bags, may in general be estimated at from twenty-five to thirty shillings the acre.

\* Marshall's Rural Economy of Yorkshire.

† Kent's Hints.

‡ In the Rural Economy of that district Mr. Marshall has given a full and very interesting description of the business.



When this sort of plant succeeds well, and the season is favourable for securing the seed, the crops are extremely profitable to the cultivators, forty or fifty bushels or more being frequently produced on the acre. Mr. Marshall thinks, indeed, that on the whole "it may be considered as one of the most profitable crops in husbandry. There have been," says he, "instances, on cold unproductive old pasture lands, in which the produce of the rape crop has been equal to the *purchase value* of the land \*." The seed is sold by the last of ten quarters, for the purpose of having oil expressed from it, by mills constructed for that use; the husks, after the oil has been in a great measure squeezed from them, forming the cakes employed in feeding cattle. The price varies considerably, but lately has seldom been much below thirty pounds the last.

Rape crops are, however, precarious, both in the early cultivation and the securing of the produce: being often much injured while young by insects, somewhat in the manner of turnip crops; when in blow, or in the period between blossoming and forming the seed pods, in the spring, as about the beginning of May, by frosts, blight, and mildew; and in securing the crop, if the time of cutting be not nicely attended to, or much rain fall, there is much danger of its being lost or destroyed.

The culture of this crop for seed has been considered by many as objectionable, on account of the great degree of exhaustion of the land that it is supposed to produce; but where it is grown on a suitable soil and preparation, with proper attention in the after-culture, and the straw and offal, instead of being burnt, as is the common practice, converted to the purposes of feeding and littering cattle †, it may in many instances be the most proper and advantageous crop that can be employed by the farmer ‡.

The most general application of this sort of crop is, however, as a green food for sheep, in which use it is scarcely surpassed by any other vegetable, in so far as respects its nutritious properties, and those of being agreeable to the taste of the animals; but in quantity of produce it is inferior to both turnips and

\* Rural Economy of Yorkshire.

† It is remarked by Mr. Marshall, in the work just noticed, that "the value of the straw to cattle in winter is very considerable. The *stover* (pulls and points broken off in threshing) is as acceptable as hay, and the tops are eaten with an avidity nearly equal to cut straw, better than wheat straw. When well got, the smaller butts will be eaten up clean. The offal makes excellent litter for the farm-yard, and is useful for the bottoms of mows, stacks, &c."

‡ Ibid.



cabbages. In this application the crops are fed off occasionally from the beginning of November to the middle of April: being found of great value, in the first period, in fattening dry ewes, and all sorts of old sheep; and in the latter, for supporting ewes and lambs. The sheep are folded upon them in the same manner as is practised in the consumption of turnips. In this way they are found to pay from fifty to sixty shillings the acre, that quantity being sufficient for the support of ten sheep for ten or twelve weeks.

Rape has been found by experience to be superior to turnips in fattening sheep, and in some cases even to be apt to destroy them by its fattening quality. It is likewise observed that that which is grown on fresh land has the stem as brittle as glass, and is superior to every other kind of food in fattening these animals; while in that produced on old tillage land, the stem is tough and wiry, and has but little proof in it\*.

When neat cattle are put upon this food in its green state, care is necessary that they have not too much of it at first, as they are very liable to be *hoven* by it.

It has been suggested by a late writer, that the cultivators of this crop, in order to turn it to the best account, should constantly keep in view the circumstance of its being capable of a double application: as by feeding it off with sheep in autumn, the succeeding crop may not be much injured; consequently a large supply of winter food be procured, without the quantity of seed being much, if at all, lessened. This is, therefore, conceived to be the most profitable management in crops of this kind†.

In some soils and situations this may be the case; but in general, feeding the crops lessens the quantity of seed, as a much larger produce is mostly obtained where this is not practised‡.

Whether cultivated for the seed or as a green crop for the support of live stock, rape may in many cases be had recourse to as a first crop in breaking up coarse waste lands, by paring and burning, with great advantage; but in the former view it can seldom be repeated with propriety at any very short distance of time.

In letting the crop stand for seed, birds are to be carefully kept from it, as they are apt to devour large quantities from their being particularly fond of it.

\* Corrected Report of Lincolnshire.

† Modern Agriculture, vol. II.

‡ Ibid.



*Carrots.*—Though this valuable root has been cultivated in a local manner for a great length of time in this country, it is only within the last ten or fifteen years that it has been much applied to the purpose of feeding live stock by the farmer. It would seem to have been introduced into the southern parts of the island from the Low-countries, where its culture and use as food for horses had been long known and practised.

Although there are many varieties of the common carrot \*, there seems to be only one that is proper for being cultivated in the field for the purpose of feeding animals. This is the sort usually termed the *orange carrot*, in which the colour is much more dark than in the other varieties, and the flesh more saccharine and juicy. The root of this variety mostly rises to nearly double the size of that of the pale yellow kind.

The soils on which crops of this root succeed to the greatest advantage are those which have considerable depth of fine mold, either of the friable, loamy, sandy, or vegetable earthy, kinds; but they may probably be cultivated to advantage on most sorts, except those of the stiff clayey and thin gravelly or chalky descriptions. The black deep vegetable, and the rich deep sandy, soils, appear however the best calculated for this sort of crop, as well as most other kinds: and the medium sands and sandy loams stand next, as best adapted to its culture †.

In the preparation of the land for carrot crops, as the roots of the plants are of the tap kind, repeated deep ploughing is particularly necessary, in order that they may be enabled to push downwards, and distend themselves with facility in the soil; as in this sort of husbandry, where due pulverisation is not effected to a considerable depth, the roots are liable to become forked and of very limited growth, sending off numerous lateral roots, in consequence of their inability to get down; by which the quantity and value of the produce are greatly lessened. This deep tillage may be perfectly accomplished either by means of the trench-plough following the common one, or by the common one alone, with a good strength of team; but the former method is to be preferred, wherever the lands are inclined to be stiff or heavy. Three ploughings are mostly found sufficient, where the land has been previously in a state of tillage; but more may in other cases be necessary. The first ploughing should be made to the depth of ten, twelve, or fourteen inches, and be performed when the soil is tolerably dry, about the beginning of October. It may remain

\* *Daucus Carota*.

† Young's Annals of Agriculture, vol. XXV.



in this condition till towards the middle of February, when it should be turned over a second time, but in a cross direction, to nearly the same depths. In March a third ploughing may be given, in order to the putting in of the seed. This may be somewhat lighter than the preceding ones. By the two deep ploughings being thus given in the autumn and winter months, the ground becomes more open and porous, from being so much exposed to the action of the frosts and other causes, than could otherwise have been the case. At the last ploughing in March a suitable proportion of well-rotted farm-yard dung should constantly be turned into the soil; the surface of the ground being immediately afterwards well reduced and rendered as level as possible by harrowing. The land is now ready for the reception of the seed. It has been fully shewn, by various trials detailed in the Annals of Agriculture and other books on husbandry, that, though good crops of carrots may be occasionally grown without the use of manure, it is only by the liberal application of that substance that the greatest produce possible can be obtained, as they are in general found to bear a relative proportion to the quantity that may have been employed.

*Seed.*—The cultivator of carrot crops should always be careful in saving his own seed, by selecting annually some of the most perfect and best-shaped roots of the preceding year's growth, to be set out separately about the beginning or middle of March, in an open piece of ground, for the purpose. The seed will be ready about August. By this means the agricultor will always be in possession of such new or fresh seed as may be depended upon, which is seldom the case when purchased; old and imperfectly ripened seed being frequently blended with the new, by which the crops often either wholly fail, or come up in a very imperfect and unequal manner. Besides, seed of the *pale yellow* kind, or what is termed the *horn carrot*, a sort often cultivated in the Low-countries and in France, but which, as has been observed, does not grow to any thing near the size of the deep orange kind, is often disposed of to the cultivators of this vegetable.

From the lightness of this kind of seed, and its adhering so closely together, other substances have been found necessary to be mixed or blended with it, in order that the seeds may be separated, and sown or dispersed over the ground with more regularity. Saw-dust, bran, ashes, dry earth, and dry sand, have been occasionally made use of for this purpose; but the two first are probably the most proper, as being the most nearly of the weight of the seed. Some cultivators, however, think that it may be sown more evenly without any of these



matters being incorporated with it, by only being well rubbed and passed through a sieve, to separate it perfectly, after having been well dried in the sun\*.

The proportion of seed that is made use of varies considerably among different cultivators; but from four or five to six pounds, when sown in a broadcast method, may in general be the most suitable quantity, according as the land recedes from a sandy quality†. But where the drill plan by a machine is followed, two pounds to the acre are said to be fully sufficient‡.

The period of putting this sort of seed into the soil is generally about the middle of March; but it should not on any account be protracted later than the beginning of April. It may, however, be put in much earlier, when the land is in a state of preparation for it, without any danger being apprehended from the season.

*Method of Sowing.*—The most common practice in putting carrot crops into the ground is that of the hand or broadcast method, the seed being dispersed as evenly as possible over the land, after the surface has been reduced to a very fine state of pulverisation by harrowing, in order to provide a suitable bed for it to vegetate in; being then covered in by means of a light harrow. As the seed of the carrot is not of a nature to be deposited with much regularity by the drill, and as the young plants can be easily set out to proper distances in the operation of hoeing, this is probably the most appropriate method of putting such sort of seed into the ground. And an additional proof of it is indeed found, in its being that which is almost universally adopted in those districts where carrot husbandry is practised to the greatest extent||.

With the view of having the after-culture of the crops more perfectly performed, and at the same time to save the great expence of hand labour in hoeing the crop, the drill method has, however, been attempted by some cultivators, but we believe without complete success. The work is finished in equidistant rows at the distance of from twelve to fifteen or eighteen inches from each other, according to the mode of hoeing that is practised. In this business some cultivators do not make use of drill-machines, but strike the land into small furrows by hoes or other implements contrived for the purpose, and then

\* Annals of Agriculture.

† Amos on Drill Husbandry.

‡ Corrected Report of Suffolk.

|| Ibid.



cast the seed over the ground by the hand, covering it in either by slight harrowing, or hoeing in the tops of the ridglets\*.

In this method, where a drill machine is used, it has been advised by an intelligent cultivator to deposit the seed to the depth of one inch in the rows, leaving the spaces of fourteen inches between them as intervals; the seed in these cases being previously steeped in rain water for twenty-four hours, and left to sprout, after which it is mixed with saw-dust and dry mold, in the proportion of one peck and a half of each to a pound of the seed. The land is afterwards lightly harrowed over once in a place. Two pounds of seed in this mode is found, as has been observed, sufficient for an acre of land†.

*After-Culture.*—As plants of the carrot kind while young are of a rather delicate nature, and do not rise quickly, it is of great importance to keep them from being too much crowded together, and as free as possible from being shaded by weeds, in their first growth. This may be accomplished by means of very small narrow hand-hoes about three inches in width, with handles not exceeding a foot and half or two feet in length, the labourers resting upon their knees in making use of them. But as in this way there is considerable danger of too many plants being destroyed, where the workmen are not expert, it may be a better practice to have recourse to hand-weeding, as in this mode the weakest plants may with certainty be removed until the rest are left at their proper distances, and the weeds at the same time be wholly taken away. This operation may be rendered less difficult by having the crops sown on ridges of such breadths as may easily be managed by two or three persons. By this means the business may indeed be performed in nearly as expeditious a manner as by the hoe, the trouble of separating the weeds from the plants in that way being so considerable, and by the operation being performed in this effectual manner at first, there will be less trouble in the future hoeings. A second hoeing should be given in the course of three or four weeks from the first, according to the growth of the crop. This may be executed by means of the common hand-hoe, the operators carefully setting out the plants to their proper distances. These vary in practice from nine to eighteen inches, twelve being that most generally adopted‡. In the county of Suffolk, where carrot husbandry is car-

\* Young's Annals of Agriculture, vol. XXV.

† Amos on Drill Husbandry.

‡ Annals of Agriculture, vol. XXV.



ried to a considerable degree of perfection, the most usual distance is fifteen or eighteen inches each way. And at these distances they have found, by long experience, that the crops are finer and the roots larger, than when the plants are permitted to stand nearer to each other \*. The tops of the plants by these distances have likewise full room to distend themselves and cover the surface of the soil, by which it is kept perfectly moist and mellow, and consequently in the best state for the nutrition of the plants, as well as for the roots swelling out to their full size. A third hoeing is commonly practised some time in June, according as the growth of the plants or weeds may require. In this, the weeds are to be completely removed; and where the carrot-plants stand double or too closely together, the weakest plants are to be cut out, till the whole are left at their limited distances.

Further hoeings may occasionally be requisite, of which the cultivator must judge; as it is of the greatest importance in this husbandry to keep the land well stirred and the crops perfectly clean, their goodness materially depending upon such operations being duly performed.

In the drill method the intervals may be cleaned by a small light plough for the purpose, or the horse-hoe. Even when executed by the hand-hoe, before the plants appear, as has been practised by some cultivators, it may constitute an advantage in the drill method †.

The expence of this business is different in different situations, according to the expertness of the persons employed, and the method in which the work is performed. The average expence of different experimenters in various soils and situations, as stated by the intelligent editor of the *Annals of Agriculture*, is 1*l.* 16*s.* the acre; but in Suffolk, where the culture is familiar, and the work of course executed with much facility and expedition, it only costs from 16*s.* to 18*s.* or a guinea the acre.

It is the practice with many cultivators of this useful vegetable to let the roots remain in the soil during the winter season, to be taken up as they may be occasionally wanted in the feeding of cattle or other animals. But as the crown of the root, by its retaining moisture, is not only extremely liable to rot and decay in these seasons, but the other parts of it from their saccharine quality to be greatly consumed by grubs or other insects below the ground; it is a custom that ought not to be recommended, especially as the crops can be pre-

\* *Modern Agriculture*, vol. II.

† *Legrand*, in *Annals of Agriculture*.



served with the greatest ease and safety in any dry situation under cover. The difficulty or impossibility of getting up the roots in many cases of hard frost or deep snow, when they are wanted, also renders the custom highly injudicious and improper. The taking them out of the ground is, therefore, to be constantly advised. The proper period of performing the business is in September or October, when the tops first begin to turn of a yellowish colour, and to lose their freshness. These points should be nicely attended to; as, if the work be delayed too long much loss will be sustained, in the tops being considerably decreased in bulk, and rendered almost incapable of being consumed by swine or neat cattle; and when performed too early the roots will not by any means keep so well.

In taking up the crops two methods have been practised; those of raising the roots by means of the plough, and the fork. The first is the most expeditious, but the roots are apt to be much broken; while by loosening the mold by three-pronged forks of sufficient length, and at the same time drawing up the plants by the tops, they may be raised with great facility, and without sustaining injury. This method, though perhaps rather more expensive, ought in general to be adopted. After being raised from the ground, the roots should be suffered to remain in the field for two or three days, that they may become perfectly dry. With this intention they are sometimes piled up in small heaps or wads. When fully dry, the tops are cut off, and the roots packed up in heaps with dry straw, or, when in small quantities, with dry sand, in some dry close building, a good covering of the former being laid over them. This is the most secure method. But when the crops are extensive, they are sometimes built up in the field or other convenient place, in rows or ridges, at the distance of two feet from each other, tops outwards, with dry straw, to about four feet in height; the intervals being then stuffed, and the tops well covered over by it, sedge or some other similar material being applied by way of thatch. The outsides are also protected by straw, kept close by means of flakes or hurdles\*. In this mode, which can only be practised in very dry situations, there is great loss from the tops not being removed and eaten before they were put up. In dry situations they may, however, be well preserved without this trouble or expence, in sheds or other convenient places. But in whatever way they may be preserved, they should not be put up in too large quantities or too closely together, as they are liable to be much injured by heating.

\* *Annals of Agriculture*, vol. II.



The expence of taking carrots up must vary much with the goodness of the crop, the nature of the land, &c. The average of several trials on different kinds of soil, under different sorts of culture and management, and in different situations, has been calculated at 17*s.* 8*d.* the acre \*. In many cases it will not, however, much exceed half the sum. *Cleaning, topping, and carting*, in the same trials, under similar circumstances, were found on the average to be 15*s.* 7*d.* the acre: the whole expence of procuring crops of this kind, in such cases, being in the proportion of six pounds four shillings and eleven pence the acre; or, in relation to the quantity of produce afforded, about two pence three farthings the bushel: the quantity of produce, on an average of the whole of the different experiments, being about five hundred and twenty-nine bushels the acre †. The expence of cultivating this root on a poor sandy soil, not worth more than five shillings the acre, is stated as below by the writer of the Report of the State of Agriculture in the County of Suffolk ‡: the produce in this case being about two hundred bushels on the acre. The first cost, of course, about three pence the bushel. In medium crops on middling sorts of land the produce may in general be from three hundred to three hundred and fifty bushels on the acre §, the expences of cultivation being from three to four pounds. On comparing them, in these crops, with those of the turnip kind, the difference has been found to be about one pound in favour of the latter §.

It is obvious from the above statements, that though the expences of carrot husbandry are very considerable in most sorts of land, the largeness of the produce, its utility in the feeding of various kinds of live stock, and the improved condition in which the soil is left by it, warrant its introduction, wherever the cultivator is possessed of those sandy or other descriptions of soil that are suitable for it, as the most advantageous that can be pursued.

\* Annals of Agriculture, vol. XXV.

† Ibid.

|                                                      | £.   | s. | d. |
|------------------------------------------------------|------|----|----|
| ‡ Deep ploughing once                                | 0    | 7  | 0  |
| Expence of seed and sowing                           | 0    | 4  | 6  |
| Hoeing                                               | 1    | 1  | 0  |
| Taking up and topping 5 loads, of forty bushels each | 0    | 5  | 0  |
| Carting                                              | 0    | 5  | 0  |
| Reaping, &c., and rates                              | 0    | 7  | 0  |
|                                                      | £. 2 | 9  | 6  |

‡ Modern Agriculture, vol. II.

§ Ibid.



The consumption of this sort of crop has been chiefly in the feeding of horses, and the keeping of different sorts of cattle, sheep, and hogs; but as, from its firm fleshy nature, and its containing much saccharine matter, it is found to possess the property of quickly rendering animals fat without being employed in very large proportions, its most advantageous application would seem to be in that view. It has indeed been observed, on the authority of experience, that it may be made use of with the greatest profit in the fattening of bullocks\*. And the experiments of other cultivators have shewn, that in fattening other sorts of animals it is equally if not more advantageous†. When made use of in this way, the quantity must be proportioned to the size of the animal, a suitable proportion of good hay or cut chaff being employed at the same time. In the early parts of the season, while the root is in its most juicy state, more of this dry food should be given than afterwards, when much of it is dissipated by keeping.

This root is highly relished by all sorts of cattle; store neat stock are found to thrive well upon it; and when given to milch-cows, the quantity of both milk and butter is said to be greatly increased, without their flavour being in any way impaired; but crops of this nature can perhaps only be employed in this way with profit under particular circumstances, as where there is not live stock to be fattened.

In the fattening of sheep, it has been found in some districts to be particularly beneficial, one acre of it being equal to two and a half of turnips‡. Hogs readily become fat upon this food, when it is prepared by boiling; but when given in a raw state, it has not, in some trials, answered well||; though in others the animals have soon been made fat by it.

But the most general consumption of carrot crops has been in the feeding of working horses; in which they have saved much corn, without the animals sustaining any inconvenience. In this application the general daily allowance is from forty to fifty pounds each horse. When joined with cut chaff and a little hay, they are found to keep the animals in proper condition for performing all the different purposes of farming labour. This sort of food is mostly begun to be given them towards Christmas, and continued till the latter end of April. It is supposed by some, that it is better for spring than winter use; they of course give a much smaller proportion at the latter season. This is probably

\* Corrected Report of Suffolk.

† Modern Agriculture, vol. II.

‡ Young's Eastern Tour.

|| Eastern Tour, vol. IV. p. 99.



owing only to the root being more fresh and succulent, and of course requiring more dry food to be joined with it.

The value of crops of this nature must be different according to the way in which they are applied in their consumption\*. The difference has been found to be from two pence halfpenny to two shillings; but in general it may be from six pence to eight pence or ten pence the bushel, which on four or five hundred bushels is considerable.

On the whole, from the facility of cultivating carrot crops, the little danger that attends them, their great application in feeding and fattening various kinds of animals, the vast quantity of manure they produce, and their utility in preparing the land for grain, they may in general not only be considered as superior to turnips, but much better adapted and more advantageous on all pure sands or light sandy loams. This is indeed still more shewn by their having been found by experiment to be capable of being grown with profit in succession on the same land†; as, though the cultivator may only have a small portion of ground suitable for this root, he may constantly be provided with it. Notwithstanding the neglect that has attended it, probably from its properties and value not having been well ascertained, it should be more generally cultivated wherever the soils are proper for it, not only as the means of saving the great consumption of oats and beans by horses, but as of much utility in the feeding and fattening of different sorts of live stock.

It seems probable too that carrots, after being prepared by boiling, might be converted to the purposes of fattening different kinds of poultry with great advantage, as they are extremely fond of them. Parsnips have been found highly useful in this mode of application, as will be seen below.

\* In the trials of different experimenters, as stated by Mr. Young in the twenty-fifth volume of the *Annals of Agriculture*, the results were these:

| Application.                    | Value per bushel. |    |    |
|---------------------------------|-------------------|----|----|
|                                 | £.                | s. | d. |
| In feeding all sorts of cattle  | 0                 | 0  | 2½ |
| The average in different ways   | 0                 | 1  | 0  |
| In fattening oxen               | 0                 | 0  | 6  |
| In fattening hogs, boiled       | 0                 | 2  | 0  |
| Used instead of oats for horses | 0                 | 0  | 6  |
| In fattening hogs, raw          | 0                 | 0  | 8  |
| In fattening sheep              | 0                 | 0  | 4  |

† Young's *Eastern Tour*, vol. IV.



It has been attempted, in order to render the large tops of carrots useful, to convert them into a sort of hay, by mowing them over while green and juicy, without wounding the heads of the roots, and afterwards drying them on the ground. In this way two tons of fodder are said to have been produced from an acre of land \*. It is obvious, however, from plants of this sort taking in part of their nourishment by their leaves, that if cut while perfectly green, much injury must be done to the growth of the roots. But, independent of this, such a method must be uneconomical from the great loss that must be sustained in rendering the tops dry and proper for being put together in stacks. It is a much less wasteful practice to take up such crops gradually, making use of the tops in the feeding of hogs, neat cattle, horses, or sheep; all of which are extremely fond of them.

When it is thought necessary to wash the roots before they are made use of in the feeding or fattening of animals, it may be performed with ease and expedition in the same manner as has been recommended for potatoes.

*Parsnips.*—This is another plant of the tap-rooted kind that has been occasionally cultivated, though in a very limited manner, for the purposes of husbandry. The garden parsnip † is the sort employed in field culture: which when properly cultivated has a long fleshy root, considerably larger than the carrot, and equally sweet, nutritious, and juicy; and, from its being capable of withstanding the severity of the winter season, is probably better adapted to the northern parts of the island. From its easy culture, and the great quantity of food that it affords, it would seem to demand more attention than has hitherto been bestowed upon it by the British farmer.

The soils most suited to this plant are those of the rich, deep, mellow, loamy or sandy kinds, in which the roots can run down to a great depth, and distend themselves with facility. On the gravelly and the pure clayey soils they can never be cultivated to much advantage ‡.

Whatever the nature of the soil may be on which this root is cultivated, it must, in the same manner as for carrots, be broken up to a considerable depth, and have the mold brought into a fine state of pulverisation. In districts where the plant is grown for the purposes of husbandry, there are two different methods pursued: the first is that of ploughing the ground by means of a light

\* Baker, in Transactions of Dublin Society.

‡ Hazard, in Bath Papers.

† *Pastinaca sativa*.



plough, which is regulated in the fore part by two wheels being fixed to it, one of which runs in the furrow, and the other on the unploughed land, the former being fourteen or fifteen inches higher than the latter, and which opens down and turns the mold to the depth of about five inches; after which, the furrow is dug down with a spade, so as to form a trench of about sixteen inches in depth, proceeding in the same way till the whole of the field is prepared: but the latter, which is by means of two ploughs of different kinds, one following in the same track after the other, is by much the most expeditious and economical. The light plough just described answers very well in performing the first part of the operation; but in the second, one of the *trench* kind must be made use of, by which the mold is raised from the bottom of the furrow made by the first, and applied over the slice it had turned up. In this way the soil is not only broken up to a great depth, but the surface left in a fine state of mold. Where this sort of tillage is practised, the work is generally performed in the more dry sorts of land about the middle of February; and in those that are retentive of moisture, towards the latter end of March. The ground, after being thus exposed to the influence of the atmosphere for a week or a fortnight, is harrowed lightly over in order to render it fit for the seed. In some cases, however, a slight ploughing is given to the lands intended for this crop in September, the use of the other ploughs being had recourse to in January in the succeeding year. The principal object in this business is that of loosening and rendering the soil mellow to as great a depth as possible.

The use of manure is not in general so necessary for this crop as many others; but where the land is not in tolerably good heart, it should constantly be employed in such proportions as may be thought sufficient. The well-rotted farm-yard dung is in common the best adapted to this crop, being turned into the soil by a light ploughing immediately before the time of putting in the seed.

*Seed.*—Seed for this crop should be collected from the best and most perfect plants, by transplanting\*, in the manner that has been already directed for other sorts of seed-crops; and should always be made use of while perfectly fresh, old seed frequently either wholly failing or coming up with great irregularity.

The proportion of seed that may be employed must be different, according to the nature of the soil, and other circumstances; but in general about four-twelfths of a bushel to the acre may be sufficient †.

\* Communications to the Board of Agriculture, vol. I. † Ibid.



*Time and method of sowing.*—The most usual period of putting this kind of crop into the ground is in the early part of the spring, as soon as the frosts will admit of it; as about the beginning or middle of February. It is, however, sometimes sown in the autumn of the preceding year, immediately after it has been ripened and collected from the plants, as about the beginning of September. It is contended that in this way the plants will appear more early in the following spring, and of course become large and strong before any weeds rise to injure them: and that as the plants are in little or no danger from the severity of the winter season, this is, on the whole, the most eligible period. Where the soil is, however, in a proper state of preparation, as there can be no apprehensions of their being inconvenienced by the growth of weeds, the former may be the most safe and convenient season for the purpose.

If the transplanting method be intended to be practised, which may perhaps sometimes be attempted where the land cannot be got into a suitable state of preparation for receiving the crops at the above period, but which does not in general answer with tap-rooted plants, the parsnip seed should be sown at the time just mentioned, upon small beds of good rich ground, rendered fine by repeated digging and raking, either in the garden, or the field in which they are afterwards to be planted; the seed in this case being sown thinly, and the plants, where they stand too closely together on coming up, thinned out to proper distances, in order that they may become strong at the time of transplanting in the spring.

The most usual method of sowing the parsnip seed is in broadcast over the land, being afterwards covered in by means of a light harrow. It is probable that this sort of crop might be sown in rows, either by means of the drill machine, or by having small furrows made in the land and sowing the seed over it in the broadcast method, afterwards lightly harrowing it into them. In this mode, by having the rows at sufficient distances, the crops might be kept more clean and at less expence than in the simple broadcast method.

In transplanting this sort of crop, great care should be taken to injure the roots of the plants as little as possible in drawing them from the seed-beds. They are then to be put into furrows made by the plough to the depth of five or six inches, at the distance of eight or ten inches from each other, the plants being regularly dispersed along the rows for the purpose. In performing this work, care should be taken that the roots of the plants are not bent, and that the plants stand upright, their leaves being free from mold. After the earth has



been brought about them, which should be done by persons immediately following the planters for the purpose. The next row is to be put in in the same manner, at the distance of eighteen inches from the former, and the whole field finished in the same way. The dibble is objected to in these cases, on account of its rendering the ground hard, and improper for being penetrated by the tender fibres of the roots of the plants\*. This method of putting in parsnip crops is best performed in the beginning of April, if the state of the season will permit.

In districts where parsnips are much cultivated as a field crop, it is the common practice to have beans at the same time with them, either planted in single rows, at the distance of four feet and a half, and about eight or ten inches from each other, or double ones at the distance of twelve feet and eighteen inches in the rows. In this manner two crops are obtained from the same piece of ground; but unless care be taken to remove the beans in good time, great injury may be done to the parsnips. As, though there may have been much leaf and stem before, the roots of these plants begin to swell out and acquire their size towards August, the beans ought never to be suffered to remain longer than that period upon the ground†. It may, however, be better in many instances, especially where they are cultivated in the drill method, to have only the parsnip crop; as, while the land can be kept equally clean, the roots will probably be much larger in size.

*After-Culture.*—Crops of this sort require to be kept perfectly clean and free from weeds during the early part of their growth; frequent hoeing and weeding are, therefore, to be practised. Where cultivated in rows at sufficient distances, the intervals may be cleaned by the plough or horse hoe. It is sometimes usual, where this sort of crop forms a part of field husbandry, to have recourse to the harrow before the process of hoeing or weeding is begun. This must be performed about the time the seed first begins to germinate; as by harrowing too soon the weeds will not have risen, and if deferred too long, there will be danger of destroying the buds of the parsnips. This is supposed more necessary on the stiffer sorts of soil, as it renders them more easily weeded. The first weeding may be performed about the beginning or middle of May, according to the forwardness of the plants, being at this operation only partially thinned out where they appear to stand much too close together. The same operation is to be again performed about the beginning of July; when the

\* Bath Papers.

† Communications to the Board of Agriculture, vol. I.



plants must be carefully set out to the distance of six inches. This sort of work is executed either by means of a small fork with two prongs, or a kind of very small spade having a short handle; the labourer, in making use of it, kneels on one knee, and, holding it in his right hand, digs and turns the mold, while with his left he pulls up and removes the weeds\*. After this second weeding nothing further is found requisite in the parsnip culture.

As this sort of root strikes downwards to a great depth, and of course draws much of its nourishment from below, it may with propriety be introduced after most sorts of fibrous-rooted crops. There is little hazard in the cultivation of parsnip crops, except from the falling of too much rain immediately after sowing, by which the seed may be in danger of being washed away; or, when dry weather succeeds, from the baking of the land rendering the plants incapable of pushing their roots sufficiently down. They are seldom injured by frosts or other causes during the winter season, or liable to be destroyed by any kind of insects.

The produce of this sort of crop, when cultivated on a proper soil and in a suitable manner, will, from the great size of the roots, be probably equal if not greater than that of carrots.

The application of this root is much the same as that of the carrot. In the fattening of cattle it is found equal if not superior; performing the business with as much expedition, and affording meat of exquisite flavour and a highly juicy quality. The animals eat it with much greediness. It is reckoned that thirty *perches*, where the crop is good, will be sufficient to fatten an ox of three or four years old, when perfectly lean, in the course of three months. They are given in the proportion of about thirty pounds weight, morning, noon, and night; the large ones being slit in three or four pieces, and a little hay supplied in the intervals of these periods.

When given to milch-cows with a little hay in the winter season, the butter is found to be of as fine a colour and as excellent a flavour as when feeding in the best pastures†. Indeed, the result of experiment has shewn, that not only in neat cattle, but in the fattening of hogs and poultry, the animals become fat much sooner, and are more bulky, than when fed with any other root or vegetable. Besides, the meat is more sweet and delicate‡.

\* Communications to the Board of Agriculture, vol. I.

† Ibid.

‡ Ibid.



When chopped and used with dry cut meat, horses are also said to eat them freely and thrive well upon them.

But, besides the root, the tops afford much green food for cattle and hogs, either after being cut off when taken up, or when consumed in the field. In the latter method the proper time of turning the animals upon them is when they first begin to shrink and grow dry\*.

In order to preserve them for spring use, they may be dug up, in the same manner as carrots, in the close of the autumn, and be packed up in the same way.

As this root is capable of being grown to advantage on soils that are too heavy for the carrot, and possesses equal, if not superior, properties for the feeding and fattening of various kinds of animals, it would seem to require more attention than has hitherto been bestowed upon it by cultivators.

*Mangle Wurzel.*—This is another of the tap-rooted kind of plants that has been introduced into field culture†. It is probably a variety of the common beet. The plants grow to a large size, both in their roots and tops, the former being of a whitish red colour. The leaves in the latter are of an oblong shape, extremely thick, fleshy, and succulent. They are said to be equal in quality to Spinach, and, from their frequently extending in length more than thirty inches, and in breadth above twenty, to greatly exceed that vegetable in point of produce.

This, like all the other tap-rooted plants that have been employed for the purposes of husbandry, thrives best in the deep, friable, sandy, or light loamy kinds of soil.

In preparing the ground, it is necessary to render it as deep and fine as possible in the mold. This may be best effected in the heavier sorts of land, by means of trench ploughing, in the manner that has been recommended for the parsnip; and in those of the lighter kinds by repeated common deep ploughing. In both cases the frequent use of the harrow will likewise be requisite. A proportion of good manure should also be turned in, so as to render the ground sufficiently rich for the perfect growth of the plants. After this, at the time of putting in the seed, the land should be thrown into two-bout ridges, which leaves the tops about two feet in breadth and the furrows one. In this way a considerable increase in the depth of mold is provided for the

\* Communications to the Board of Agriculture, vol. I.

† *Beta major*.



roots of the plants. And in soils that are in some measure retentive of moisture, the lands are kept by it much drier and in a state more fit for the growth of the plants.

*Seed, and time of sowing.*—The seed should be carefully selected from such plants as are the most perfect of their kind, and that have been cultivated at a distance from other sorts. It should have arrived at a full state of ripeness, and be made use of while fresh. The proper time for putting the seed into the ground, in the common method of sowing, is in the early part of the spring, as soon as the season will admit, as in the beginning or middle of April; but where the transplanting method is intended, it should be sown much earlier, and very thinly, as the beginning of March, in order that the plants may be in a state to set out early.

*Method of sowing.*—The most common method, where the surface of the land is flat, is to sow thinly over the ground, in the manner that is practised for carrots, covering the seed in by means of very light harrowing. In this way the plants are afterwards set out by the hoe. But where the land is raised into ridges, in the manner just described, another mode is practised; the seed is dropped singly by the hand into little holes made by a dibble to the depth of about half an inch all along the middle of them, at the distance of eight or nine inches from each other, the plants thus standing at the distance of three feet from row to row, and eight or nine apart in them. But as it is not necessary that they should stand nearer than sixteen or eighteen inches, every other plant may be removed, and used for filling up the vacancies where they occur, or if not wanted in that way, wholly removed by the hoe. In this mode the intervals can be kept perfectly clean by the plough or horse-hoe, and the rows by hand-hoeing.

Where the practice of transplanting is adopted, the plants should be removed when not more than three or four inches in length, and be planted in rows upon ridges prepared as above, at the distance of eighteen inches each way. In performing the work the holes should be made sufficiently deep to admit the roots without their being bent. The tops of the plants may be taken off before planting; but the roots should not be touched, nor should they be put in too deep. A rather moist season should be chosen, if possible, for this business. But though the plants grow well in this method, the roots seldom become so large as when they have remained in their original situation.



*After-Culture.*—All that is necessary in this crop is to set out the plants to proper distances, where put in in the first methods, and keep them clear and free from weeds by one or more hoeings, according to the manner of sowing that may have been practised.

The application of this vegetable has been chiefly in the feeding of neat cattle and hogs; in which both the tops and roots have been employed, but without that success which might have been expected from the manner in which it was brought to the notice of cultivators. It is probable that, upon the whole, the root has neither been found to be equal in quality as a cattle food, nor to afford the quantity of produce, that was supposed on its first introduction; but, from its being of a hardy nature, and not liable to be injured either by insects or the effects of drought, as well as from its leaves being capable of being repeatedly cut over\*, it may be occasionally cultivated in situations where green food is much wanted in the latter end of the year for milch-cows, or other sorts of live stock. In some trials the plants seem, however, to have afforded a large produce in leaves, when gathered every two or three days from July till late in September†. Others have not found the whole produce in leaves and roots equal to that of the large cabbage on the same kinds of soil, while the culture was considerably more troublesome and expensive, and the crop not so useful for the purpose of winter consumption‡.

In the trials of an ingenious cultivator, the tops were found to be eat with much greediness by cows, calves, and hogs, when cut green, during the latter part of the summer and in autumn; but the roots were almost wholly rejected at these periods, though in winter, after they had been taken up, they were eaten very well||.

The roots frequently rise to the weight of from five to eight or ten pounds, according to the goodness of the land, and may be preserved in the winter by being taken up and packed in the manner that has been recommended for carrots.

The chief objections to this vegetable as a field plant are, the great expence of its culture, its being liable to degenerate, and the fibrous nature of the roots rendering their preparation as cattle food troublesome.

\* Where this practice is adopted, the roots will probably seldom rise to any great size.

† Annals of Agriculture, vols. XI. and XII.

‡ Ibid. vol. XI. p. 53.

|| Wimpey, in Bath Papers.



*Plantation Crops.*—Besides the various kinds of crops that have been already described, and which serve either for the purpose of human or cattle food, there are several others which are not applicable in these ways, but which are extensively cultivated in different places, in order to be converted into different sorts of manufactures, or for their application in the arts of brewing, dyeing, &c. These, as they require particular modes of culture, and are frequently grown on the same spots of ground for a considerable length of time, may with propriety be termed *plantation crops*.

*Hemp.*—This is a plant of the herbaceous fibrous-rooted kind, which has a thick strong stem, that rises to a considerable height, and affords a rind or covering of a firm strong texture, that is valuable for the purpose of being manufactured into cloth, cordage, &c.

The soils most suited to the culture of this plant are those of the deep black putrid vegetable kind, that are low and rather inclined to moisture, and those of the deep, mellow, loamy, or sandy descriptions. The quantity of produce is generally much greater on the former than on the latter; but it is said to be greatly inferior in quality. It may, however, be grown with success on lands of a less rich and fertile kind, by proper care and attention in their culture and preparation.

In order to render the grounds proper for the reception of the crop, they should be reduced into a fine mellow state of mold, and be perfectly cleared from weeds, by repeated ploughing. When it succeeds grain crops, the work is mostly accomplished by three ploughings, and as many harrowings; the first being given immediately after the preceding crop is removed, the second early in the spring, and the last or seed earth just before the seed is to be put in. In the last ploughing, well rotted manure, in the proportion of fifteen or twenty, or good compost in the quantity of twenty-five or thirty three-horse-cart loads should be turned into the land, as without this it is seldom that good crops can be produced. The surface of the ground being left perfectly flat, and as free from furrows as possible; as by these means the moisture is more effectually retained, and the growth of the plants more fully promoted.

*Seed, and method of sowing.*—It is of much importance in the cultivation of hemp crops that the seed be new and of a good quality, which may in some measure be known by its feeling heavy in the hand, and being of a bright shining colour.



The proportion of seed that is most commonly employed is from two to three bushels, according to the quality of the land; but as the crops are greatly injured by the plants standing too closely together, two bushels or two bushels and a half may be a more advantageous quantity.

As the hemp plant is extremely tender in its early growth, care should be taken not to put the seed into the ground at so early a period as that it may be liable to be injured by the effects of frost, nor to protract the sowing to so late a season as that the quality of the produce may be affected. The best season, on the drier sorts of land, in the southern districts, is probably as soon as possible after the frosts are over in April; and, on the same descriptions of soil, in the more northern ones, towards the close of the same month, or early in the ensuing one: but when the ground is more inclined to moisture, it may be a better practice to delay the sowing to a later period in both cases, choosing, if possible, a time when the land is neither too dry nor too moist for performing the business. Sowing as early as possible is, however, in general, to be preferred; as where this is the case, by the crops becoming more strong and vigorous in the early part of their growth, the hemp is found to withstand the various operations that are afterwards to be performed upon it in a better manner\*.

The most general method of putting crops of this sort into the soil is the broadcast, the seed being dispersed over the surface of the land in as even a manner as possible, and afterwards covered in by means of a very light harrowing. It is probable, however, that in many cases, especially where the crops are to stand for seed, the drill method in rows at small distances might be had recourse to with advantage; as in this way the early growth of the plants would be more effectually promoted, and the land be kept in a more clean and perfect state of mold, which are circumstances of importance in such crops. In whatever method the seed is put in, care must constantly be taken to keep the birds from it for some time afterwards.

This sort of crop is frequently cultivated on the same piece of ground for a great number of years, without any other kind intervening†; but in such cases manure must be applied with almost every crop in pretty large proportions, to prevent the exhaustion that must otherwise take place. It may be sown after

\* *Modern Agriculture*, vol. III.

† Mr. Young in the *Agricultural Report of Suffolk* has remarked it to have been grown in succession for seventy years together.



most sorts of grain crops, especially where the land possesses sufficient fertility, and is in a proper state of tillage.

*After-Culture.*—As hemp, from its tall growth and thick foliage, soon covers the surface of the land, and prevents the rising of weeds, little attention is necessary after the seed has been put into the ground, especially where the broadcast method of sowing is practised; but when put in by the drill machine, a hoeing or two may be had recourse to with advantage in the early growth of the crop.

In the culture of this plant it is particularly necessary that the same piece of land contains both *male*, and *female*, or what is sometimes denominated *simble*, hemp. The latter kind contains the seed.

When the crop is ripe,—which is known by its becoming of a whitish yellow colour and a few of the leaves beginning to drop from the stems, and is commonly about thirteen or fourteen weeks from the period of its being sown, according as the season may be dry or wet, the first sort being mostly ripe some weeks before the latter,—the next operation is that of taking it from the ground, which is effected by pulling it up by the roots in small parcels at a time, by the hand, taking care to shake off the mold well from them before the handfuls are laid down. In some districts the whole crop is pulled together, without any distinction being made between the different kinds of hemp; while in others it is the practice to separate and pull them at different times, according to their ripeness\*. The latter is obviously the better practice; as by pulling a large proportion of the crop before it is in a proper state of maturity, the quantity of produce must not only be considerably lessened, but its quality greatly injured, by being rendered less durable†. The expence of this operation varies considerably in different districts; in some it amounts to eighteen or twenty shillings, while in others it is equally well performed for eleven or twelve. After being thus pulled it is tied up in small parcels, or what are sometimes provincially termed *baits*.

But where crops of this kind are intended for seeding, they should be suffered to stand till the seed becomes in a perfect state of maturity, which is easily known by the appearance of it on inspection. The stems are then pulled and bound up as in the other case, the bundles being set up in the same manner as grain, until the seed becomes so dry and firm as to shed freely; it is then either

\* Corrected Report of Suffolk.

† Modern Agriculture, vol. III.



immediately threshed out upon large cloths for the purpose in the field, or taken home to have the operation afterwards performed.

The after-management of hemp crops varies greatly in different places where their culture is encouraged; in some it is the practice to only what is called *dew ripen* or *ret* the produce, while in others the general custom is to *water ret* it.

In the former method, the hemp, immediately after being pulled, is carefully spread out in a very even, regular, and thin manner, on a piece of level old pasture, on which it is to remain for five, six, or more weeks, according to circumstances, being occasionally turned during the time. When the weather is showery, this is mostly done three times in the week; but in other cases twice is commonly sufficient. When the rind or hempy substance becomes easily separable from the woody part or stem, it is taken up and tied into bundles, either to be stacked up on the spot, or carried home and placed in some convenient situation, where it may remain until it can be manufactured. In this process, which is termed *grassing*, great attention is requisite to prevent the texture of the hemp from being injured by its remaining too long on the grass.

But the latter practice is much better and more expeditious, as well as more general. In this the hemp, as soon as pulled, is tied up in small bundles, frequently at both ends. It is then conveyed to pits or ponds of stagnant water about six or eight feet in depth, such as have a clayey soil being in general preferred\*, and deposited in *beds*, according to their size and depth; the small bundles being laid in both a straight direction and crosswise of each other, so as to bind perfectly together; the whole being loaded with timber or other material, so as to keep the beds of hemp just below the surface of the water: the quantity of an acre, or three small waggon-loads, being in some instances piled in one bed; but as the action of the atmospheric air is essentially necessary to produce that degree of putrefaction which is requisite for destroying the small fibres and vegetable gluten by which the bark or hempy substance adheres to the *bun* or stem, it may be more advantageous to build them in much smaller beds; as by such means the business may not only be more expeditiously accomplished, but the danger of rotting the hemp too much prevented. And on the same principle the depth of the ponds should not exceed the dimensions given above. It is not usual to water more than four or five times in the same pit.

\* Corrected Report of Suffolk.



till it has been filled with fresh water\*. Where the ponds are not sufficiently large to contain the whole of the produce at once, it is the practice to pull the hemp only as it can be admitted into them, it being thought disadvantageous to leave the hemp upon the ground after being pulled. It is left in these pits four, five, or six days, or even more, according to the warmth of the season, and the judgment of the operator, on his examining whether the hempy material readily separates from the reed or stem; and then taken up and conveyed to a pasture field which is clean and even, the bundles being loosed and spread out thinly stem by stem, turning it every second or third day, especially in damp weather, to prevent its being injured by worms or other insects. It should remain in this situation for two, three, four, or more weeks, according to circumstances, and be then collected together when in a perfectly dry state, tied up into large bundles, and placed in some secure building until an opportunity is afforded for breaking it in order to separate the hemp. By this means the process of *grassing* is not only shortened, but the more expensive ones of breaking, scutching, and bleaching the yarn, rendered less violent and troublesome. Besides, the hemp managed in this way sells much dearer than that in the former method. After the hemp has been removed from the field, and the business of *grassing* properly performed, it is in a state to be broken and swungled; operations that are mostly performed by common labourers, by means of machinery for the purpose, the produce being tied up in stones. The refuse collected in the latter processes is denominated *sheaves*, and is in some districts employed for the purposes of fuel, being sold at two pence the stone†. After having undergone these different operations, it is ready for the purposes of the manufacturer.

The produce of hemp crops is extremely variable and uncertain. In Suffolk it sometimes rises to forty-five and fifty, or even more, stones on the acre; but in other cases it does not much exceed half these quantities. The average of crops of this sort, when made ready for the *heckle*, is stated by a late writer to be from thirty-eight to forty stones of fourteen pounds each. The price is generally from about seven shillings and six pence to eight or nine shillings the stone, exclusive of the bounty allowed by government, which often amounts to fifteen or twenty shillings the acre more‡. When sold on the ground as the crop stands, it generally fetches in Suffolk about one shilling the rod, or eight pounds the acre.

\* Corrected Report of Suffolk.

† Ibid.

‡ Modern Agriculture, vol. III.



In cases where the hemp stands for seed, the most common proportion is from about eleven to twelve bushels on the acre, the price being from four or five to six shillings the bushel.

The expences of cultivating and managing the different operations in crops of the hemp kind, from their requiring the best sorts of soil, much manure, and great attention and trouble, must of necessity be considerable. From the statements of the able writer of the Survey of the County of Suffolk, they however appear highly beneficial to the cultivator. They are as below\*; but it is obvious that they must be liable to vary greatly according to circumstances.

\* At Hoxne the expences and profit were found to stand thus:

| EXPENCES.                                |   |   |   |   |   | £.   | s. | d. |
|------------------------------------------|---|---|---|---|---|------|----|----|
| Rent, tythe, and rates                   | - | - | - | - | - | 1    | 10 | 0  |
| Manure, 25 loads, at 1s. 6d.             | - | - | - | - | - | 1    | 17 | 0  |
| Three earths, at 4d., harrowing included | - | - | - | - | - | 0    | 12 | 0  |
| Seed                                     | - | - | - | - | - | 0    | 16 | 6  |
| Sowing                                   | - | - | - | - | - | 0    | 0  | 6  |
| Pulling                                  | - | - | - | - | - | 0    | 12 | 10 |
| Watering                                 | - | - | - | - | - | 0    | 12 | 0  |
| Graffing                                 | - | - | - | - | - | 0    | 10 | 0  |
| Breaking                                 | - | - | - | - | - | 2    | 12 | 6  |
| Carriage and delivery                    | - | - | - | - | - | 0    | 5  | 0  |
|                                          |   |   |   |   |   | £. 9 | 8  | 10 |

| PRODUCE.                     |   |   |   |   |   | £.   | s. | d. |
|------------------------------|---|---|---|---|---|------|----|----|
| Forty-five stone, at 7s. 6d. | - | - | - | - | - | 16   | 17 | 6  |
| Expences                     | - | - | - | - | - | 9    | 8  | 10 |
| Profit                       | - | - | - | - | - | £. 7 | 8  | 8  |

But at Beccles, where a very different mode of calculation takes place, and rent is valued, they were these:

| EXPENCES.              |   |   |   |   |   | £.    | s. | d. |
|------------------------|---|---|---|---|---|-------|----|----|
| Rent, tythe, and rates | - | - | - | - | - | 4     | 0  | 0  |
| Manure                 | - | - | - | - | - | 3     | 0  | 0  |
| Tillage                | - | - | - | - | - | 1     | 4  | 0  |
| Seed, twelve pecks     | - | - | - | - | - | 1     | 16 | 0  |
| Pulling                | - | - | - | - | - | 0     | 19 | 0  |
| Watering               | - | - | - | - | - | 0     | 12 | 0  |
| Graffing               | - | - | - | - | - | 0     | 10 | 0  |
| Breaking               | - | - | - | - | - | 2     | 10 | 0  |
|                        |   |   |   |   |   | £. 14 | 11 | 0  |
| PRODUCE.               |   |   |   |   |   |       |    |    |



Though the profit on hemp may appear considerable in these estimates, its cultivation has not increased in any very rapid manner; which is probably owing to its requiring a larger proportion of manure than can commonly be spared from the other sorts of crops, as well as its demanding a great and constant attention through the whole of its management, which frequently interferes with the other operations of the farmer. In districts where its culture is the most extended, it would seem, however, to be of great utility and advantage to the poor, by affording them much employment in the different processes and manipulations through which it is necessary for it to pass before it becomes in a state fit for the manufacturer.

When hemp crops stand for the purpose of procuring the seed, they should remain upon the ground till perfectly ripe; when, after being pulled, the produce should be placed thinly upon its root end against a wall, paling, or other convenient situation, according to the state of the weather, until it becomes quite dry: the top parts containing the seed are then cut off, the seed being threshed out immediately and cleaned; as when it is suffered to remain any length of time in its moist uncleared state, its colour is liable to be much injured, and the substance so much impaired as not only to be improper for the purpose of sowing, but on being crushed for oil to afford a less quantity, and such as is of an inferior quality\*. The buns or stems of the hemp may afterwards either be put into the pond to be *watered*, or *dew retted* in the manner described above: the former practice is, however, in general to be preferred; as where the latter is adopted the hempy substance seldom becomes of so good a colour†.

According to a late writer, the most advantageous period for the farmer to dispose of hemp crops, is while they remain upon the ground, just before the season of pulling them; as by this means he avoids the trouble and uncertain expence of the different operations which are requisite in its preparation for the market, and which are so liable to interrupt his other business. In cheap populous districts, where the soil is suitable, and there is a large extent of grass or other sorts of green crops in proportion to the arable, hemp crops may probably be intro-

|                     | PRODUCE. |   |   |   |           |
|---------------------|----------|---|---|---|-----------|
| Fifty stone, at 8s. | .        | - | - | - | £. 20 0 0 |
| Expences            | -        | - | - | - | - 14 11 0 |
| Profit              | -        | - | - | - | £. 5 9 0  |

\* Farmer's Magazine, vol. I,

† Corrected Report of Suffolk.



duced and cultivated to great profit by the attentive farmer; but while the demand for grain continues so great, it is not very likely that its culture should become extensive in other situations.

As hemp, from its growing to a great height and being very shady in the leaf, leaves the land in a perfectly clean condition, it may, where the soils are proper, be an excellent preparation for wheat crops; and where they are too light for that sort of grain, barley or turnips may be had recourse to with advantage.

The hemp produced in this kingdom is in general considered as superior to that imported from abroad, and of course more proper for being converted into the various finer sorts of cloths and cordage.

*Flax.*—This is another plant of the fibrous-rooted kind cultivated in the field for the purpose of the cortical substance covering the stem, and the seed. It is the common flax plant\* that is employed in this culture, which rises in stem to the height of from two to three feet.

The soils most suitable for crops of this sort are those of the more deep and friable loamy kinds, and such as contain a large proportion of vegetable mold in their composition. On strong loamy clays that have been well broken down and reduced by tillage, they have also been found to answer well. The sandy or very light gravelly lands are seldom found to succeed well with flax crops. But whatever the nature of the soil may be, it should neither contain too large a proportion of moisture, nor be too dry; but have the mold in a fine and well-pulverised condition. Such lands as are situated rather low, as upon the banks of rivers, are found by cultivators to be well adapted to the growth of flax. It has indeed been contended by some, that where the soil contains water at no great depth below the surface, it is the most beneficial for the growth of this crop; as in those parts of Holland and the Low-countries where it is grown in the greatest perfection, the ground is always found to be deep, and rather inclined to stiffness and the retention of moisture at some depth below the surface. The lands for this crop should neither be in too rich nor too poor a condition: as when the former is the case the flax is apt to grow too luxuriantly and of course to produce a *coarse* sort; and on the contrary, where they are in the latter situation, the plant by growing weakly affords only a small produce.

In the preparation of the land, as it is necessary that it should be made perfectly

\* *Linum usitatissimum.*



fine in the mold, it must be repeatedly ploughed over, and broken down by harrowing. When the land is to be broken up from the state of sward, the first ploughing should be given late in the autumn, and be left in that condition till the beginning of the succeeding year; when it should be well reduced by harrowing with a pretty heavy harrow, and afterwards, in the course of a week or two, ploughed over a second time, in which situation it may be left till the period of putting in the seed, when it ought to be again harrowed over by a lighter harrow, and ploughed with a very light furrow: but where flax is sown after grain or other sorts of crops that keep the land in a clean state, the first ploughing need not be given until the beginning of the year, in which state it may remain till it becomes tolerably dry in the early spring, when it must be well broken down by harrowing and rolling, and after it has continued in that situation for eight or ten days or more, according to circumstances, the land will be ready for the seed, or, if not perfectly fine, another light ploughing and harrowing may be given previous to the putting in of the seed.

Flax crops are cultivated after most sorts of grain, as wheat, rye, and oats, as well as after different kinds of green crops, as turnips, potatoes, and several others; but when put in after the latter the flax in general succeeds the best.

*Seed.*—That which is fresh and sufficiently ripened should constantly be preferred; which is known by its being more bright and shining in its colour, more oily in the feel, and more weighty in the hand. Seed of home produce is sometimes made use of for sowing; but more generally that which is imported from other countries, as Holland, the Baltic, and America; that brought from the first is, however, mostly held in the highest estimation, from its quality of ripening more early than the others, and affording a more abundant produce of that sort of flax which is most useful in the different manufactures; that brought from the Baltic is supposed to produce a coarser sort of flax, but a larger proportion of seed, than any of the other kinds. The American seed yields in general a flax sufficiently fine; but the seed-pods being small, there is not so large a quantity of seed obtained from it. In Yorkshire they frequently sow the seed of home produce for white flax; but where seed is intended to be taken, the Baltic sort is preferred, which, for the succeeding and a year or two afterwards, is found to answer well as white flax. And in the northern parts of the kingdom it is often a practice to sow seed obtained from the crop of the preceding year, especially where it was raised from imported seed. It is supposed by the cultivators of this sort of crop, that their success in raising it depends greatly on the seed



being frequently changed, and such as is imported from abroad being made use of. It is probable, however, that if that selected from the finest and most perfectly ripened seed of our own growth was employed, it would be equally productive both in the flaxy substance and the quantity of seed, and at the same time afford the former of an equally good quality for all the purposes of the manufacturer. In Ireland they prefer the American seed for their lighter and more elevated grounds, and the Dutch or Baltic for those of the more heavy kind\*.

*Quantity of seed.*—The proportion of seed is variable according to the circumstances of the soil, the uses to which the produce is to be applied, and the method of sowing that is practised; but in general from two bushels to two and a half may be considered as sufficient for the acre, when sown in the broadcast manner. It should never be sown very thick, except where the flax is required to be very fine in quality. For, when the seed is sown too thick, the plants, from being so close together, are liable to be drawn up to a great height and become weak, consequently to fall down upon the ground in case of much wet weather, and the produce be thereby greatly injured in its colour and other properties. But in the drill mode of sowing, a much less proportion of seed will be found sufficient. If the distance of the rows be eighteen or twenty inches, less than one half of the above quantity will answer the purposes of the cultivator.

In short, where the crop is intended to stand for seed, in whatever manner the sowing is performed, a much less proportion of seed should be employed than where the flax is the chief object.

*Time and method of sowing.*—The period of putting flax crops into the ground is different, according to the situation and nature of the soil; but from the beginning of March to the middle of April may in general be considered as the most proper season. In Yorkshire, when this crop is cultivated upon land broken up from the state of grass, the seed is mostly sown before the second week in April, if the weather will admit of it†; and on such lands as have been in the state of tillage, the period of sowing is seldom protracted more than a week or ten days longer. Early sowing, where it can be safely adopted, has the advantage of enabling the flax plants to cover the ground well before

\* Martyn's Edition of Miller's Dictionary, art. *linum*.

† Corrected Report of West Riding, Yorkshire.



they can sustain much injury from those of the weed kind, or from the effects of the dry hot summer season.

The broadcast method of sowing is that which is the most generally employed in putting crops of this sort into the ground, especially where they are intended only for the purpose of flax; but where the seed is the chief object, they are sometimes put in in the drill method: and it is contended by some that in this way better seed may be produced, than by the former mode; as where the seed is sown thickly the plants run up more in height, and produce a flaxy substance which is of an extremely fine and soft quality; but the seed, from the weakness of the plants, is small in the grain, and not large in quantity; while, on the contrary, when sown thinly, the stems of the plants, not rising so high, are more strong and vigorous, sending off more numerous branches towards the top, by which not only a greater abundance of seed is afforded, but such as is much better filled, and more plump and heavy.

In sowing the crop in the first method, much care is necessary in the seedsmen to distribute the seed over the surface of the land in as regular and uniform a manner as possible, as without this care the crop will sustain great injury by coming up too closely together and in tufts. It is afterwards to be harrowed in by one or two light harrowings in a place; or, where the surface of the ground has been rendered very fine and even, a bush-harrow may answer the purpose equally well. The seed should not in either way be covered in too deeply, as the quick vegetation of the crop may by such means be too much retarded.

Where the drill is employed, the distances of the rows may vary according to the circumstances of the soil, or the intentions of the cultivator; but when the crop is to be kept clean by the hand-hoe, small intervals, as twelve inches, are mostly recommended; but where horse-hoes or cultivators are to be made use of, intervals of eighteen or twenty inches, or perhaps more, may be proper, care being taken that the machine does not deposit the seed to too great a depth in the soil. After the operation has been performed, a bush-harrow, or light harrow of the common kind, may be once passed over the surface just to render it even. When the soil is of a dry kind, and the season is inclined to be dry, in either method of sowing it may be advisable to pass a light roller over the ground immediately after the seed has been put in, in order that the moisture may be more effectually preserved.

*After-Culture.*—Although it is seldom the practice of the cultivators of flax crops to weed them, especially when sown in the broadcast method, yet as the



plants are extremely tender in their early growth, and of course liable to be much injured and retarded in their vegetation by the rising of weeds, a hand-hoeing or weeding should constantly be given them, as soon as the plants are fully come up and shew themselves. This is particularly necessary where proper attention has not been bestowed in cleaning and preparing the ground by repeated ploughing, harrowing, and carrying off or burning the weedy materials. In performing the business of weeding, great care should be taken that no injury be done by cutting up or treading under foot the flax plants. It is perhaps only by keeping the land perfectly clean and free from weeds in this way, during the early growth of the plants, that good crops of this kind can be produced.

It is recommended that this operation should be performed as soon as the flax plants have advanced three or four inches in height, the weeds that are drawn out being carefully picked up and conveyed from the land\*. By having the soil well prepared before the seed is put in, much expence in this way may, however, be avoided.

In the drill method of sowing, where narrow intervals are preferred, the crop is mostly kept clean by the use of the hand-hoe; but where the distances of the rows are larger a small plough, the horse-hoe, or what is termed a cultivator, may be made use of in order to preserve the land in a perfectly clean condition. A sort of triangular harrow has also been found to be a very convenient tool for this purpose. From its having handles behind, it is capable of being guided with facility, and at the same time made to pass deeper or shallower, according to circumstances, without the danger of raising the mold against the rows of the plants. In this way the business may be accomplished by one horse at but little expence, much ground being gone over in a small space of time. In these cases, however, the rows must be cleaned by means of hand-weeding, which is accomplished with much less difficulty and harm to the crops, from the room that is afforded by the intervals.

No other sort of plant should ever be grown with that of flax, though such methods may have been in some instances practised, as the crops in such cases must always be in danger of being greatly injured.

The young flax plants are sometimes liable to be destroyed or greatly injured in their growth by the attacks of insects; where this is the case, it has been found useful to sow foot or wood ashes thinly over the crops, as from the ve-

\* *Modern Agriculture*, vol. III.



getation of the plants being in this way promoted, they become improper for the food of such animals.

As crops of this kind, from the tallness of their growth, are apt to fall down and lodge upon the ground, by which the flaxy substance is liable to be injured in its colour and other properties, it has been proposed to support and keep them up by means of long slender poles, or small cords, passed in different directions of the ground, and fixed at the angles by stakes. These methods are, however, troublesome; and where the crops are not sown too thick, will seldom or ever be necessary.

The cultivators of flax crops are not yet fully decided in respect to the degree of ripeness at which they may be pulled with the greatest benefit; some contending that it ought to be done before the greenness of the stems wholly disappears, in order that the fibres of the flax may be finer and have a greater degree of softness. Others with similar intentions maintain, that it should be pulled before the seeds are perfectly formed; while others again insist that the operation should not be performed until some of the capsules containing the seed begin to open, asserting that the fibres of green flax are not only tender but run too much to tow. But, notwithstanding this, experience has shewn that the fibres of over-ripened flax are constantly harsh, and possess too great a degree of stiffness; and besides, separate from the reed with more difficulty, and are more tedious in the operation of bleaching. Hence it would seem that both extremes ought to be carefully avoided, and that the most proper period for accomplishing the business is immediately on the stem or reed beginning to change from a green to a yellowish cast, and the lower leaves to fall off; the seed assuming a brownish colour.

Where the seed is the principal object of the grower, the crop should, however, be suffered to remain upon the ground until it becomes perfectly ripened, which is easily known by the seed-pods turning hard and sharp in the points, and the capsules beginning to crack and open. This generally happens towards the latter end of July or beginning of August.

In pulling, the flax is laid in small parcels or *beats* upon the surface of the ground, in such a position as that it may have the full benefit of the sun. It is then to be tied up, and conveyed as soon as possible to the place of watering. As where this sort of crop is cultivated upon a large scale, from the great differences in the soil and other causes, there will be considerable variations in the quality of the flax, some being fine, others coarse; some long, and others short;



care should be taken at the time of pulling to separate and put the different sorts together; as by this means the injuries sustained by subjecting flax of such different qualities to the same operations and processes, may be avoided. It has been remarked by an intelligent writer, that inattention in flax cultivators to this necessary precaution, is the chief cause why crops of this kind often turn out of so little value, and the principal reason of the smallness of the proportion of such flax as is of a good quality in comparison with that of the tow or inferior sort; the different manufacturers, in the course of their operations, being under the necessity, on account of the mixed condition in which they receive it from the cultivators, to reduce the quality of the whole to a much lower degree than would be requisite if the different kinds were sorted at the time of pulling the crops, and delivered under such circumstances\*.

When the seed is intended to be saved, it is the usual practice in pulling the crop to place the handfuls partly across each other, as by this means the business of *rippling* is greatly facilitated, the operators not having the trouble of separating them from the large bundles.

The operation of *rippling* should be performed as soon as possible after the crops have been pulled. This is accomplished by means of a sort of iron comb with strong triangular teeth of considerable length, set upright, pretty closely together, and fixed upon a strong flat piece of wood, so as that the operators can sit at each end, and by frequently striking the seed-end of the flax upon it, and pulling it through with rapidity, the seed-pods are forced off with much expedition, and in a very perfect manner. Where the seed thus obtained is intended to be preserved, a large cloth should be spread out previously in some convenient situation for the purpose of receiving it from the ripple, and it should be immediately afterwards spread out thinly, and exposed to the sun, till the capsules containing it become perfectly crisp and dry; they are then to be broken and the seed separated from them by lightly threshing or treading upon them; the whole of which being afterwards well cleaned by winnowing and sifting, and laid up in a dry room. And when a large quantity is put together, it should at first be frequently turned over in order to prevent its being injured by heating. The seed which is procured from such crops as are intended for flax, and which have not stood till it is perfectly ripened, may be collected and sold for the purpose of having the oil expressed from it; but it is improper for use as seed.

Some experienced cultivators of flax, when grown for the seed, set up the

\* Donaldson's Present State of Agriculture, vol. III.



produce, when tied into sheaves, in the manner of grain, and when it is become perfectly dry, have it stacked up until the ensuing spring, when, by placing the tops of the sheaves towards each other, and making use of a roller, the seed is easily forced out. In this way more time is supposed to be allowed for the after-management \*. In most districts where much attention is bestowed, it is likewise the practice, even when the crops are only cultivated for the purpose of the flax, to ripple off the seed-pods before the business of watering is commenced; as it is found from experience, that when it is put into the water without this having been done, the water, from its quickly becoming putrid, is liable to do much injury to the flax.

The stem parts are tied up into small parcels containing two or three handfuls, in a rather loose manner, in order to their being carried to the pond for the purpose of *watering*, which is the next operation that becomes necessary.

The intention of this process is that of inducing a slight degree of putrefaction, by which the substance that unites the flaxy material to the stem or reed is destroyed, and the flax of course rendered easily separable. In this crop, as in that of hemp, there are two methods practised for the purpose of accomplishing the business; one of which is by immersing it in ponds of stagnant water for some time, and the other by exposing it to the influence of the atmosphere till the same circumstance takes place. The former is the most general practice, and commonly esteemed more certain as well as more safe from injuring the flax; the exact point of putrefaction that is requisite not being so easily ascertained in the latter method. Whichever practice is adopted, the length of time which is required for accomplishing the purpose, depends considerably upon the state of ripeness at which the crops have been pulled, the quality and temperature of the water in which it is placed, and the moisture or dryness and warmth of the season in which it is exposed.

In *water retting* the flax, ponds of stagnant soft clear water are constantly preferred, as being found much superior to those of other kinds. The greater the degree of warmth the water has attained before the flax is immersed in it, the sooner the process is effected, the heat of the water greatly promoting the perfect separation of the harl or flaxy material from the reed. The rule for judging when the flax has undergone a sufficient degree of maceration in the water, is that of the cuticle or skin readily peeling off from the bun or stalk the whole length; the latter breaking as if rotten, and appearing of a deep yellow colour.

\* Perth Corrected Report.



The manner of depositing the flax in the water is much the same as that already described for hemp: in some cases, however, instead of the small bundles of flax being placed crossways over each other, they are set in an erect position, the tops of every layer except the lowest being upwards. And instead of keeping the whole down below the surface of the water by stones, wood, or other heavy materials, earth is made use of, to the depth of a few inches, and men employed to tread the whole down occasionally once or twice a-day at first, so as to keep it from rising above the surface; as when that happens, the flax becomes black and the sale is injured\*. The first seems, however, the most simple and easy method.

After having thus remained in the water a proper length of time, as five, six, or more, days, according to the particular circumstances of the case, the flax is taken from the pits by means of drags, and laid on the sides perfectly straight for a few hours, in order that it may become somewhat dry; it is then removed to a pasture or grass field that has been lately mown, where it is to be spread out thinly in rows in as even and regular a manner as possible, each row overlapping the other a few inches, in order the better to prevent their being disturbed by the wind. When left in lumps and not spread evenly, the flax is liable to become green, and never afterwards to be capable of being made a good colour.

After having remained in this situation for a few days, it should be turned, which is best done after a shower or two of rain. When the colour is become perfectly bright and even, and the cuticle or skin begins to rise, blister, and separate from the stem or reed, it is ready to be taken up. For this business a fine dry day should be chosen, if possible; and the flax, after being bound into pretty large bundles, may either be stacked up for use afterwards, or be immediately broken and scutched in the manner already advised for hemp.

In the second or *dew retting* method, which is much practised in some of the southern districts of the kingdom, as in Dorsetshire, the flax, immediately after being pulled, is spread out in rows thinly upon a grass field, where it is occasionally turned until the process of putrefaction has, in a more slow and gradual manner than in the above practice, effected the condition which is necessary for the easy and perfect separation of the flaxy material from the reed or stem. But in this mode there is considerably more danger, from the flax being under the necessity of remaining a much greater length of time exposed to the action and effects of the weather and other causes. But in whichever method the flaxy

\* Corrected Report of the West Riding of Yorkshire.



material is brought into the proper condition for being separated from the reed or stem, great care should be taken that it be not damaged by continuing too long upon the grafs, as in many cases, especially in rainy seasons, the under side next the grafs is liable to be rotten or greatly tendered, before the upper one is nearly in a suitable state of preparation. The supposition that exposure in the field tends to expedite the process of bleaching in the manufactured article is not well founded; in practice no cloth being found to bleach with so much expedition, or in so uniform a manner, as that made from such flax as has been water-retted in a complete and equal manner\*.

Before the business of *breaking* or *scutching* the flax can be performed, which is the next operation that it undergoes, it becomes necessary either to expose it to the heat of the sun, by placing it against a wall or paling in a slanting position; or the effects of fire, by putting it over hurdles, or, what is much better, placing it in an oven heated by means of the refuse of the flax. In either case the fire should be applied in such a manner as that the heat may be very moderate. The flax should only be permitted to remain such a length of time as may be just sufficient to remove any damp it may have acquired. In these ways the dampness is dispelled in a more equal and safe manner than by any other method except that of the sun, which is always to be preferred when possible.

In regard to produce there is scarcely any crop that varies more considerably than that of flax, either in the quantity or quality of the article. From twenty to sixty or seventy stones of fourteen pounds each have been obtained from an acre of land, according to circumstances; but from forty to fifty stones may be reckoned a medium crop. The expence incurred in the cultivation and after-management of this sort of crop is very considerable, arising from eight to ten or twelve pounds an acre on the average, where the object of the grower is the flax†. When these crops are disposed of before pulling, which is the

\* Corrected Agricultural Report of Perth.

† It has been estimated by some in this way:

| EXPENCES.                                       |   |   |   | £. | s. | d. |
|-------------------------------------------------|---|---|---|----|----|----|
| General expences in preparing land, sowing, &c. | - | - | - | 6  | 0  | 0  |
| Rent, taxes, tythes, &c.                        | - | - | - | 2  | 13 | 4  |
| PRODUCE.                                        |   |   |   |    |    |    |
| Forty stones at 9s. per stone                   | - | - | - | }  | 18 | 13 |
| Bounty at 4d. per stone                         | - | - | - |    |    |    |
| Profit                                          | - | - | - | £. | 10 | 0  |

But



practice of different northern districts where the culture of flax is extensive, the price is in general from about six or seven to ten pounds, or upon the average something more than seven pounds.

When flax seed is the aim of the cultivator, the quantity of that sort of produce is generally from about six to ten or twelve bushels on the acre. The price depends upon various circumstances, as the quantity of foreign seed that is imported, the demand there is for it for the purposes of being expressed for its oil, or for being formed into a sort of jelly as food for fattening cattle. It is mostly about half the price of that which is imported from Holland for the purpose of sowing. On the average it may probably be estimated at from about three or four to five or six shillings the bushel.

It seems probable from these statements, that flax may be grown with great profit and advantage in many situations, as in grass districts, where labourers can be easily procured to perform the different operations it requires about the harvest season, where the produce of grain crops more than supplies the demands of the inhabitants, and where there are means of providing due supplies of manure. But under other circumstances, as from the fibrous nature of its root, the size of its stem, the smallness of its leaf, and the quantity of seed which it affords, it cannot but exhaust and impoverish the land without returning any thing in the way of manure, it should perhaps seldom be had recourse to.

But in other calculations the profit is not so great. In the Corrected Report of the State of Agriculture in the West Riding of Yorkshire it stands thus:

| EXPENCES PER ACRE.                      |   |   |   |   | £. | s. | d. |
|-----------------------------------------|---|---|---|---|----|----|----|
| Working the land                        | - | - | - | - | 0  | 16 | 0  |
| Seed                                    | - | - | - | - | 1  | 1  | 0  |
| Sowing and weeding                      | - | - | - | - | 0  | 5  | 0  |
| Pulling                                 | - | - | - | - | 0  | 10 | 0  |
| Leading, diking, &c.                    | - | - | - | - | 0  | 10 | 0  |
| Taking out and spreading                | - | - | - | - | 0  | 12 | 0  |
| Turning and taking up                   | - | - | - | - | 0  | 5  | 0  |
| Rent of land when let to flax-grower    | - | - | - | - | 5  | 5  | 0  |
| Dressing 50 stones at 1s. 6d. per stone | - | - | - | - | 3  | 15 | 0  |
| Profit                                  | - | - | - | - | 7  | 11 | 0  |
|                                         |   |   |   |   | 20 | 10 | 0  |

## PRODUCE.

|                                        |   |   |   |   |    |    |   |
|----------------------------------------|---|---|---|---|----|----|---|
| 50 stones of flax at 8s. 6d. per stone | - | - | - | - | 20 | 10 | 0 |
|----------------------------------------|---|---|---|---|----|----|---|



When grown after other crops, those of the turnip and potatoe kind are those that most commonly precede it\*.

The cakes produced in the process of expressing the oil from flax-seed are made use of for the purpose of fattening cattle with great success, and in consequence the price has of late been unusually high.

A mucilaginous or jelly-like substance is also prepared from flax-seed, by means of boiling, or the pouring of water in a boiling state over the seed when crushed, which is much employed in the fattening of live stock.

*Hops.*—The hop is a plant of the fibrous-rooted perennial kind, which climbs to a considerable height, under the support of poles. There is only one species of this plant in cultivation†, but which has several varieties, as the *red-bind*, the *green-bind*, the *white-bind*, &c.‡ It is chiefly grown for the sake of the bud and flower, which are employed in the brewing of beer and other malt liquors, for the purpose of imparting an agreeable bitter to them.

The first of the above varieties affords a very small hop; but, from its hardy nature, is capable of being cultivated in exposed situations, and where the climate is cold and not adapted to the other sorts||. It is said to possess the property of resisting the *blast* more effectually than any of the other varieties, often appearing healthy and vigorous, in seasons when the other kinds are greatly infested with flies and lice§; and at the period of picking to be less exposed to injury from the effects of the sun or rain than those of other sorts.

The second or *green-bind*, though less hardy than the preceding kind, is considerably more productive, and on the middling descriptions of land, in situations that are not too much exposed, often succeeds very well.

But the third or *white-bind*, which is still more delicate and tender, is the most in estimation, on account of its being more early, and the produce selling at a much higher price. In hops there are also male and female plants; but

\* It is remarked by the intelligent writer of the Corrected Report of the State of Agriculture in the County of Perth, that in the law of Scotland a crop of this sort is considered as a *green crop*, and that of course actions brought against tenants by proprietors for sowing flax crops instead of those of the ameliorating kind, would be lost by the latter. It is, therefore, suggested that this should be guarded against by having closes in the leases specifying in a particular manner the quantity of land to be annually cropped with flax.

† *Humulus lupulus*.

‡ They are likewise sometimes distinguished into the *Flemish*, the *Canterbury*, the *Goldings*, the *Farnham*, &c.

|| Modern Agriculture, vol. III.

§ Synopsis of Husbandry.



the latter only afford the produce for which they are cultivated; the former should of course be extirpated as improper and useless.

It is obvious, that as these different varieties must of necessity suit different sorts of soil, and become ripe at very different periods, the planter should be cautious that plants of the different kinds are not set out in the same plantation; as when this point is wholly neglected, or not sufficiently attended to, there is much inconvenience experienced in the after-management of the crops, especially where they are large, from the difficulty of procuring a sufficient number of labourers to proceed with the business in so expeditious a manner as may be requisite for their safety; while by planting the separate sorts together in a detached manner, the business of securing and preserving the produce may be accomplished with greater convenience, as the crops become ready at different periods.

The most proper situations for plantations of this kind are those that have an easy, natural, sloping position towards the south, or which are more level, and possess the advantage of a south-westerly exposure, and which are well protected and sheltered from the effects of the north and north-easterly winds, by high grounds, tall fences, or trees of the forest kinds, rising at some distance from them. But, as the plants grow closely together, and rise to a considerable height in the stems, they should not by any means be confined, or too much closed up in the plantations themselves, but have the benefit of a full and perfectly free admission and circulation of air, as well as light and the influence of the sun; as these have not only the effect of promoting the vigour and healthy growth of the binds, but, by quickly dissipating and drying up the superabundant moisture that may rest upon them, prevent the crops from being so much injured by the *blast* or *mildew*. This is fully shown by the circumstance of the middle or more close parts of such crops, especially where they are extensive, being greatly injured in this way, while the outside parts, that have the advantage of being more fully exposed to the air, sustain no injury at all in these respects.

It has been remarked by a late writer, that such situations as are in the immediate vicinity of the sea, or near marshy and fenny levels, seldom answer for the culture of the hop-plant, as they almost invariably miscarry in bad seasons\*.

The soils most adapted to the culture of the hop-plant are those of the more deep, strong kinds, whether of the loamy, clayey, or sandy qualities. They should be such as incline to dryness, without being too deficient of moisture, and

\* Synopsis of Husbandry.



that have a considerable depth of good, rich, vegetable mould. The thin, gravelly, and chalk soils are wholly improper for the growth of plants of this nature; the former not being sufficiently retentive of moisture for the vigorous growth of the plants; and the latter, from its absorbent quality, imparts its humidity to the roots of the binds in too scanty a proportion for the healthy support of their luxuriant vegetation.

There is, however, a sort of thin slatey soil, intermixed with good rich mould, which has an under stratum of stone, that is found, by experience, to be admirably suited to the growth of the hop-plant, and on which it often rises to its fullest height and luxuriance, producing an equally abundant produce with those of the most deep, strong, and fertile kinds. Hops are extensively cultivated on a soil of this description in the vicinity of Maidstone in Kent\*.

Hops may be cultivated on such lands as have been in a state of tillage; but in these cases it is absolutely necessary that a sufficient proportion of manure be applied, to bring them into a proper state of fertility for the perfect support of the plants. Such land as has been long in a state of pasture, and which has, in consequence, accumulated a large proportion of vegetable matter, as that of old orchards, rich, dry meadows, or other grass lands, is however the most proper for the purpose.

In either case the ground should be reduced to a perfectly fine state of mould by repeated ploughing and harrowing, or, digging it over with the spade. This last is the most effectual method where the land is to be broken up from the state of sward, and should be performed in the autumn, in order that it may have the advantage of the effects of the frosts during the winter season. By these means the plantations are not only to be brought into a perfect state of pulverization, but also rendered clean, and free from all sorts of weeds. In the last operations, the ground should always be left in as even and level a situation as possible, if it be sufficiently dry; but where it is inclined to the retention of moisture, it may be ridged, in order more effectually to remove the superabundant wetness. And immediately before the season of planting, a quantity of compost, formed from well rotted dung and good fresh vegetable earth, by being intimately blended together and remaining in that state for a considerable length of time, should be applied in small heaps, so as to afford about a bushel for each hole.

The business of planting out the sets is then to be commenced, which is performed at different times, according to the nature of the plants. Where sets from

\* Bannister's Synopsis of Husbandry.



the cuttings of old binds are made use of, the work is best performed in the latter end of February, in March, or the beginning of April, as the season may suit; as these are the periods of cutting over and dressing the old binds, when sets of this sort can be the most easily obtained; but, when bedded, or root sets are employed, as may sometimes be the case on digging up former plantations, the autumn is the most proper season, as about the latter end of October, or beginning of November.

In the first of these methods the sets or cuttings should be made from the most healthy and vigorous binds, each being cut to the length of about five or six inches, having two or three eyes or joints, which are the buds, from which the roots and stems, or new binds, proceed. They are sold by the hundred of six score, at from sixpence to a shilling. In the planting, different forms and distances are preferred by different planters, according to the manner in which the after-culture of the crop is performed. Where it is executed by means of horse labour, the best method is that of setting them out in rows, at suitable distances, so as to form straight lines in every direction. But, in cases where it is to be executed by the hand, this is not of so much consequence, provided a sufficient space be allowed for the healthy growth of the plants. In this way some practise the row method, while others prefer a triangular plant. It is evident, however, that the planting in equidistant rows, so as to admit of the ground between the plants being kept clean by the harrow and nidget, must be much less expensive than that of the irregular mode, in which hand labour must be employed.

The distances at which the plants are set out, or rather those of the holes and hills formed for their reception, are different according to circumstances. Some cultivators advise six feet and a half or seven feet, while others prefer a five or six feet plant. As the hop-plant, from the luxuriance of its growth, rises to a great height, and sends forth much bind and foliage, it must of necessity require considerable space, as where the plants stand too closely together they are not only more liable to become diseased, but to *bouse* or run together above the poles, by which so much shade is produced, as to prevent the hops below from completing their growth; and of course the quantity of produce is much lessened.

On these grounds it would appear that this plant cannot be cultivated with perfect success in less space than from six to seven feet: on good rich soils the latter distance may be the most advisable, as the plants will be more at liberty to effect their full growth. In this way there will be a distance of from eight to nine feet from the centre of the hills.



The holes are set out in different ways, according to the particular custom or practice of the cultivators; some making use of a line, in which knots are formed at the distances intended, which is extended the whole length of the plantation, small sticks being then thrust down at the knots, and the land measured off from these by sticks of a proper length; others mark the holes off at once by means of stakes drove down into the ground at suitable distances each way: but a more expeditious method than either of the above is that of striking furrows by the plough in different directions of the plantations, at proper distances, so as to form a sort of squares, the holes being made in the angles where the furrows cross each other.

In making the pits or holes, the earth is taken out by a spade or *spud*, to the depth of about twelve inches in a circular form, having the diameter of about eighteen inches, the bottom mould being a little stirred. These are then partially filled with the earthy compost mentioned above; and the mould that was taken away replaced upon it so as to make a little rising or hillock. On these hillocks seven sets or roots are mostly planted by means of a dibble, one in the middle or top of the hill, and the others around it, at equal distances, about four or five inches from the sides of the holes. The sets are generally put in to the depth of about two inches in the compost, and so as to have the tops wholly covered by the mould on the surface of the hills. Some planters, however, prefer covering them lightly with the fine earth taken from the holes, after they have been planted out in the compost, to the depth of an inch and a half or two inches.

Nothing further is now necessary till about the middle of May, except keeping the ground about the plants clean from weeds; when, from the increasing growth of the young plants, it will be proper to apply an addition of fine mould about them on the hills, which may be scraped up from the intervals. And in order to check the growth of the young shoots, and thereby increase the vigour of the roots, some twist them together into a sort of knot. Others, however, advise that two small sticks, about a couple of yards in length, be set in each hill in order to direct the climbing of the shoots, three or more being led up each stick, and tied occasionally during the summer with bafs or sedge. A second moulding up will be required about the latter end of July or beginning of August, which is to be performed in the same manner as before.

There is still another mode of planting practised in some districts where the land is of the boggy kind and much inclined to moisture\*. This is that of forming the plantations into a sort of beds about sixteen feet in width, by digging out trenches three feet in width, and from two to two and a half in depth, spreading

\* Corrected Agricultural Report of Suffolk.



the earth thus removed evenly over the beds previously prepared. On these the sets are put in, after the holes have been made a spit in depth, twelve inches in diameter, and six feet apart in each direction, so as to admit three rows on each bed, in the same manner as in the other methods. The plants in this mode are poled in the course of about three weeks with old short poles, to each of which two or more of the binds are tied; the land being afterwards kept in order by hoeing and raking. The operation of hilling is performed in the latter end of June or beginning of July. This appears, however, a tedious and expensive plan, without its possessing any superiority except that of rendering the lands somewhat more dry.

It is the custom with some planters to cultivate other sorts of crops at the same time with the hops, as common beans, cabbages, french beans, and onions; but this is a practice by no means to be recommended, as much injury may be done by their crowding the plants and preventing the free admission of air, light, and sun to them, especially those that are of tall growth. The onion is the least objectionable, as not rising to any great height, and being capable of being sown at the time the sets are planted out.

It is seldom adviseable to take any produce the first year, as where this is attempted much injury is frequently done to the future produce of the plantations. In the Suffolk method of planting, a produce of three, four, and even five hundred weight of hops is sometimes however afforded the first year \*. And where bedded or root sets are made use of, a small crop may be afforded the first season, as the plants or binds will be nearly as forward at that time, as those from cuttings are in the second season †.

Where hop-plantations have been carefully formed in these methods, and the land is perfectly suitable to the growth of the plants, they will continue to bear well for twenty years or more, care being only taken to supply the defects that may occur in particular hills from the destruction of plants. But though this sort of plantation may be continued in the above manner, it is suggested as a more adviseable practice, in many instances, to renew them at much shorter distances of time, or even to keep renewing particular parts occasionally as may be necessary. And in order to render them the most productive, whether they are managed by the plough, the spade, or the hoe, the ground in the intervals should be well stirred two or three times when the seasons are favourable, and in other cases more frequently ‡.

\* Corrected Agricultural Report of Suffolk.

† Synopsis of Husbandry.

‡ Modern Agriculture, Vol. III.



In the following winter after the plantation has been formed, it will be necessary to provide and prepare the poles. Where the hop-binds are healthy and vigorous in their growth, two poles may be sufficient for each hill, or in the proportion of two thousand six hundred to the acre. But where the plants are weak and less luxuriant in their vegetation, a greater number of poles will be required, as three to each hill, or at least to each other hill, which in the latter case will be in the proportion of three thousand two hundred and fifty to the acre. But as the poles need not be so long, or of so much strength, there will probably be but little difference in the expense. In bringing the poles they should not be carted upon the ground, but be placed at the outsidcs, to be afterwards removed by the labourers to the places where they are wanted.

In the second year of the plantation it is seldom necessary to apply any manure to the hills, but the land in the intervals should be stirred in the autumn, in the same manner as in the first; but in the early part of the spring, when the weather is suitable, as about the middle of March, the hills must be opened, and the earth be well cleared away from the principal roots by means of a tool which has the title of a *picker*, in order to afford the means of pruning and dressing the stocks; in which operations all the preceding year's bearing stems are cut off within a joint or two of the roots, and all such shoots or suckers as were not permitted to attach themselves to the poles, or which have risen on the edges of the hills, fully cleared away, nothing being suffered to remain that can possibly injure or prevent the vigorous growth of the new binds. In performing this business, care should be taken to bare the different stalks and roots so completely, and to such a depth, that every thing that is hurtful may be discovered and wholly removed. And in the cutting experienced labourers should, if possible, be employed; for much depends on the work being properly executed, as great injury may be done by leaving too great a length of bind, as well as by cutting the stocks too closely. In the former case the crops may be exposed to the *canker*, and, in the latter, the hills be so much weakened as not to afford shoots in sufficient abundance \*. It is therefore necessary that the work should be carefully overlooked. After the business of pruning and dressing has been thus accomplished, the earth should be raked back again upon the plants, so as to rise into hills as before.

At this period all such plants as have been destroyed, or that have a weak and unhealthy appearance, should likewise have others put in their stead, in order that

\* Synopsis of Husbandry.



the plantations may be kept as perfect as possible. Such of the prunings as are cut from the most healthy and vigorous plants may be reserved for the purpose of forming new plantations.

In this season, as well as the preceding, three hoeings and one good moulding should be performed; the first about the beginning of May, the second in June, and the third in July; a little mould each time being drawn to the roots of the plants on the hills in order to keep them sufficiently moist. The moulding should take place in the early part of August, the earth being well laid upon the hills round the root-stems of the plants; and it should be executed, if possible, soon after some rain has fallen.

In the poling, which is the next operation to be performed, the common rule is to begin as soon as the binds have advanced two or three inches above the surface of the ground, which is in general about the latter end of April, or beginning of May. The number of poles that are the most proper and advantageous for each hill has not been yet well ascertained by planters; but as it has been shown that a full and free admission of air, light, and sun, is essentially necessary to the healthy growth of the plants, they should never be too much crowded. Three is the most usual allowance, though a greater number is often employed. They should be placed in such a manner as to leave the largest spaces or openings towards the south or south-west, that the plants may derive the more full influence of light and heat; and the stoutest on the side which has a northern aspect, the more powerfully to resist the winds. The poles are most commonly fixed in the ground by means of an iron crow, with which holes to the depth of eighteen or twenty inches are formed, and the sharpened root ends of the poles forcibly placed in them, the earth being immediately afterwards well rammed or trodden about them.

The difficulty of this business chiefly consists in pitching the holes to proper depths, in setting the poles down with such exertion as that they may fix themselves firm at the bottom, and that the tops of the poles may have such a direction outwards as to obviate, as much as can be, the *housing* of the binds. Where due attention is not bestowed in these points, much injury and loss may be sustained by the destruction of the plants. When the poles are set, two or three of the binds may be directed up each of them, being tied, in the manner advised above, in different places by labourers employed for the purpose, and which is to be repeated as there may be occasion for it. When the poles are



high and the binds strong, standing ladders may be useful in tying them near the tops.

It has been observed that this work demands particular attention in the early part of the summer. When short and slender poles have been put to hills where the binds prove of strong and vigorous growth, it may sometimes repay the trouble to have them removed, and others of a taller and stronger kind put down in their stead. The benefit obtained by this practice is often considerable\*.

During the summer, in the more early growth of the plants, the superfluous binds of every kind should be repeatedly removed as they present themselves, reserving only one or two on each hill to supply the places of such as may be hurt in being trained to the poles at first, as accidents of this nature often occur in consequence of the tender buds being bruised or rubbed off by the agitation of the winds.

This is the whole of the culture that is required till the season at which the hops become ripe, and are ready to be *picked*, which is known by the fragrant smell which they emit, their becoming firm, and acquiring a brown colour. It is usually about the beginning or middle of September.

Much care and circumspection is necessary in the performance of this business, to see that every thing proceeds with regularity and dispatch, as there is always much danger from delay, the crops being equally exposed to injury from the winds as continued rain. As a preparation for this business, *baskets*, *bins*, or *cribs*, are procured or formed, in number proportionate to the extent of the plantation and the pickers that are to be employed. The latter are constructed by nailing four or more pieces of boards on as many upright posts as frames set into the ground. When finished, they are about seven or eight feet in length, three feet in breadth, and about the same in height. The apparatus being thus made ready, the hop-binds are cut over close to the surface of the land by a person accustomed to the work, and the poles drawn up by a tool for the purpose, which is termed a *dog* or *pulling-book*. They are then placed upon the frame with the bind upon them, mostly two, but sometimes three, in order to be picked; three, four, or more pickers being employed in clearing the binds of the hops on each side of the different frames: these, with the person engaged in sorting the poles, are denominated a *set*. Women and children are frequently employed in this work. The hops, after being carefully



separated from the leaves and binds, are dropped into a large cloth hung round on tenter-hooks within, underneath the frame. When this has been filled, the hops are put into a large sack, in order to their being taken home, to be dried on kilns for the purpose. This should always be performed as expeditiously as possible after the hops have been picked, that they may not sustain any injury by remaining together in their green moist state; as where this is the case they are often liable, especially when the weather is warm, to be much damaged, both in colour and flavour, in the course of a few hours, by the heat which they take on. For this reason, it is necessary to keep the *oast* or kiln constantly at work, both night and day, during the time of picking. The number of pickers should therefore be as nearly as possible proportioned to the quantity of hops that can be dried off by the *oast*. And where, from the nature of the season or other causes, the undried hops are suffered to accumulate, they should always be placed only a few together, without being closely packed.

In cases where the crops are pretty abundant, a diligent picker will separate from eight to ten bushels a day, which, when dried, may weigh about one hundred weight. It is usual in many places to let the picking of this crop by the bushel. The price is variable according to the abundance or scarcity of labourers. From sixteen to twenty expert pickers will be necessary, in favourable seasons, and where the produce is rather abundant, to keep an *oast* at work that is capable of drying off eighty bushels at each measuring\*.

Besides the pole-puller and pickers, another person will be requisite in the hop plantation, in order to pick up the scattered branches of the binds, and convey the produce to the kiln. A boy is in general employed in this business, who, from the nature of his work, is commonly called the *poke boy*. The conveyance of the hops is accomplished by means of a cart, horse, or hand-labour, according to the distance of the plantation from the kiln.

The *drier*, or person employed in the kiln, should be perfectly acquainted with the business, regular and steady, as much of the planter's profit depends upon this work being properly performed. To this part of the management, as well as that of the pickers, the hop farmer ought to be careful to direct his attention as much as possible.

The wages of the different persons engaged in these operations are always considerably influenced by local and other circumstances. In Kent, before the late

\* Synopsis of Husbandry.



advances in the price of all sorts of farm-labour, it was usual for the pole-pullers to have from eighteen-pence to two shillings the day, with small beer; the driers half a crown, with an unlimited allowance of both beer and spirits; the pickers from three halfpence to twopence the bushel, with allowances of spirits, &c. These wages, however, at present are greatly advanced.

The structure of the hop kiln, or *oast*, is not very different from that employed in drying malt. It may be of different dimensions, as twelve, fourteen, or sixteen feet square; and have a suitable proportion preserved between the height and breadth and the sides of the steddle that contains the fire: thus, where the kiln is twelve feet square on the top, it should be eight feet in height from the fire; and the steddle six feet and a half square. It is covered with hair cloth, on which the hops are spread out, in an even manner, to the depth of from six or seven, to eight, ten or twelve inches, according as the season is more dry or moist, and the hops are more or less advanced in ripeness. Before the hops are laid upon the kiln it should be rendered a little warm, and the heat afterwards kept up by a regular gentle fire, increasing it gradually till, by the heat of the kiln and the warmth of the hops, it is found to have attained the proper height. An even steady degree of heat should then be preserved for eight, ten, or more hours, according to the state of the hops at the time they are applied; by which the ends of the hop stems become in a perfectly shrivelled and dry condition; which, with that of their rattling on being touched, is the principal indication that they have attained the proper state of dryness. Much practical experience is however necessary to conduct the process with the best effect, and in the most economical manner in respect to fuel.

Where what is termed a *cockle oast* is made use of, sea coal is mostly employed as fuel, a chaldron being considered the proper allowance to a load of hops. But where *hair kilns* are in use, as the smoke of that sort of coal would be injurious, charcoal is had recourse to for the purpose, which in Kent is generally bought for about fifty shillings the load, which consists of fifty sacks\*.

After the drying has been properly performed, the hops are removed from the kiln by means of a shovel, into an adjoining room constructed for the purpose, which is called the *stowage room*. In this chamber they are kept five, six, or more days, according to circumstances, before they are in a proper condition to be put into the bags; as when they are bagged too soon they are brittle, and do not *draw* so good a sample, or weigh so heavy. They should always remain so long as to attain a tolerable degree of toughness, which may be easily judged of by the feel.

\* Synopsis of Husbandry.



For the convenience of bagging the hops, a round hole or trap is prepared in the floor of the stowage room, exactly equal in size to that of the mouth of the bag, on which a frame of wood is placed, to which the edges of the opening of the bag are securely attached all round. A very small handful of hops being then tied firmly in each of the lower corners, the bag is let fall below, and a person termed the packer gets in, and with a heavy weight, which he keeps continually moving round, where he is not immediately treading, tramples and presses the hops down as closely as possible into the bags, as they are thrown in, in small quantities, by another person employed for the purpose. In this manner he proceeds until it is quite filled, when each of the upper corners has a few hops inclosed in them in the same way as the others, which serve the purpose of handles; and the bag is drawn up, and the mouth of it well secured, after being disengaged from the frame. In performing this business, the closer the hops are pressed into the bags the better, as they preserve their colour, smell, and taste more perfectly\*.

In the operations of drying and rendering hops proper for the bag, some loss of weight must of course take place. According to some, sixty bushels of well ripened fresh gathered hops, which have not been attacked by the fly, will produce when dried and bagged about one hundred weight.

The goodness of a sample of hops depends upon different circumstances, as the clammy feel of the yellow, farinaceous, powdery substance which is sprinkled over them, and their colour. The former in the language of the hop planter is termed the *condition*, and the sample is esteemed the more or less valuable by the buyer, in proportion as the feel is more or less clammy: and in regard to the latter, it is of the utmost importance in the sale of the hops, that it should be preserved as bright as possible, though it is not always the case that those which are the brightest in their appearance are the strongest in flavour.

It is this property, however, that induces the planter to make a distinction in the bagging of the article. The brightest hops, and those which have the finest colour, are put into bagging of a better quality, and termed *pockets*; while those of the brown kind form bags, being put in bagging of a coarser and more heavy sort. The first sort are made use of in the brewing of ales and all the finer sorts of malt liquor; but the latter chiefly in the making of porter. Where hops are to be kept for some length of time, the coarse bagging is however the best.

The length for a *bag* is about two ells and a quarter, and that for a *pocket* nearly

\* Kent's Hints.



the same, each having an ell in width. The former, where the hops are good, well cured, and tightly trodden in, weigh about two hundred and a half; and the latter, when of the Canterbury pocketing, about one hundred and a half. Where they much exceed or fall short of these weights, it may be suspected that they are either of an inferior quality, or have been injured in their preparation. The planter will be best directed in respect to the duty on hops, by a copy of the excise laws respecting them.

After these operations have been performed, it will be proper to clear the poles of the binds, and set them up in stacks as soon as possible, unless, as is sometimes the case, it has been done at the time of picking, as they are apt to sustain much injury by remaining upon the ground with the bind upon them. The work is usually performed by the acre, the poles being piled up into square stacks; thirty or forty poles being set to each corner, which should stand about twelve feet apart in each direction at the base, the tops uniting as closely as possible. In this way an opening is formed below, which contributes to dry and preserve the poles.

At this period all such poles as are too short, or in any way improper for further use, should be laid aside, in order that such of them as are suitable may be employed in the new plantations; and that the planter may fully ascertain the proportion of fresh poles that may be necessary for the following season, which it is of great advantage to have provided, brought upon the ground, set up conveniently in stacks, and sharpened, when there is leisure in the winter months. The points of the old ones may also be put in order at the same time, and nothing be thus left to interrupt the business of poling at the proper season. The best poles, which are those of ash, chestnut, and willow, of the length of from eighteen to twenty-four feet, will seldom last longer than six or seven years; and those of an inferior kind, as from beech, maple, oak, &c. not nearly so long. The bark is shaved off all the sorts except those of the ash kind, (in which it separates of its own accord in the second year,) in order to prevent their being destroyed by worms lodging in them.

After the poles have been stripped and stacked up, the bind should be cleared away, which, in some districts, is done by tying it up into bavons or small bundles when perfectly dry, and putting it in stacks, sheds, or other convenient places, for the purpose of fuel in ovens, &c. This work is performed at the rate of about sixpence the hundred. In others it is burnt upon the ground; and, in some, the labourers are permitted to take it home for their own use. But whatever method



This should be executed as early as possible in the autumn or winter months, in order that the land may have the full influence of the frosts. The work should be performed in a dry season, and be accomplished with as much expedition as possible, the most careful and trusty labourers being always employed. It is usually done at a fixed price for one hundred hills, as from two shillings to half a crown. The labourer makes use of a three-pronged fork, which in some places is termed a *spud*, for the purpose, each prong being about an inch and a half in breadth. It is of great consequence that this operation be executed in a very perfect manner, much of the success of the plantation depending upon it. If there should be any binds of an improper kind, they may be now removed, and others of the proper sorts put in their stead.

\* Synopsis of Husbandry.

*Expenses per Acre.*

Carried over 2 2 2



year, or much longer in some cases, should be taken up, and another portion of ground fresh planted; or, what is better, a suitable proportion of the old plantation, and an equal portion of new, broken up and planted annually, or every other year, so as to preserve a regular succession, at an easy and gradual expense, as has been already observed.

There is scarcely any sort of crop that varies more in the quantity of produce than that of hops, affording, under different circumstances of soil and season, from two hundred to upwards of twenty hundred weight on the acre. On medium soils, in tolerably favourable years, it may be estimated at from six to eight or nine hundred weight, from ten to fourteen being considered as good crops. A produce of twenty hundred weight but rarely occurs, and is much too large for the planter in general to fix his expectations upon.

The whole of the expenses incurred in the cultivation of these crops, and the profits which they afford, are stated in the following manner by Mr. Kent, in his useful Hints to Gentlemen Farmers\* :

|                                                                                  | £. | s. | d. |
|----------------------------------------------------------------------------------|----|----|----|
| Brought over                                                                     | 2  | 2  | 0  |
| Sharpening new poles, at 3d. per hundred                                         | 0  | 2  | 0  |
| Shaving set at                                                                   | 0  | 9  | 4  |
| Tying                                                                            | 0  | 10 | 0  |
| Summer digging (if used)                                                         | 0  | 18 | 0  |
| Hoeing                                                                           | 0  | 5  | 0  |
| Hilling                                                                          | 0  | 3  | 0  |
|                                                                                  | 4  | 9  | 4  |
| Deduct summer digging                                                            | 0  | 18 | 0  |
|                                                                                  | 3  | 11 | 4  |
| Add nidgeting                                                                    | 1  | 0  | 0  |
|                                                                                  | 4  | 11 | 4  |
| Picking, at from 1d. to 2d. per bushel, and bagging at 8d. coarse, and 6d. fine. |    |    |    |

\* Expenses per Acre.

|                                                   | £. | s. | d. |
|---------------------------------------------------|----|----|----|
| Medium price of an acre of land suitable for hops | 1  | 10 | 0  |
| Digging the ground                                | 0  | 13 | 0  |
| Dressing and pruning                              | 0  | 8  | 0  |
| Poling                                            | 0  | 15 | 0  |
| Carried over                                      | 3  | 6  | 0  |



The expense of forming new hop plantations is very considerable. In Suffolk it is estimated at from seventy-five pounds to one hundred, when every thing that is requisite is included; the annual charges being nearly the same as those which have been just stated \*.

In the county of Kent, where the practice of letting out the culture of crops of this sort to labourers who are experienced in the business in some measure prevails, they are said not only to find a saving of expense, but to be so much relieved, in respect to the trouble of the different operations, as to consider it the most adviseable mode †. In these cases, where summer digging is omitted, and

|                                                                                                                                                        | £. | s. | d. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|----|
| Brought over                                                                                                                                           | 3  | 6  | 0  |
| Three hoeings                                                                                                                                          | 0  | 9  | 0  |
| Once moulding                                                                                                                                          | 0  | 3  | 6  |
| Tying the binds to the poles                                                                                                                           | 0  | 12 | 0  |
| Stripping the binds off the poles                                                                                                                      | 0  | 3  | 0  |
| Stacking the poles                                                                                                                                     | 0  | 4  | 0  |
| Sharpening the poles                                                                                                                                   | 0  | 10 | 10 |
| Manuring                                                                                                                                               | 2  | 0  | 0  |
| Picking, drying, and duty, at 1l. 10s. per hundred, the crop being estimated at 12 cwt. the acre                                                       | 18 | 0  | 0  |
| Bagging and occasional expense of bags, about                                                                                                          | 0  | 16 | 0  |
| Ash poles, estimated at 30,250 to the acre, and supposed to last eight years, medium price, 18s. a hundred at the stub, eighth part of which is nearly | 3  | 13 | 0  |
| Carriage of ditto, estimated at                                                                                                                        | 1  | 5  | 0  |
|                                                                                                                                                        | 31 | 2  | 4  |

## Produce.

Supposing 12 hundred per acre, and that the medium price is 4l. the hundred, the amount will be

48 0 0

And the expenses deducted out of the produce will leave a medium profit of

16 17 8

\* Corrected Agricultural Report of Suffolk.

|                                                                                                                         | £. | s. | d. |
|-------------------------------------------------------------------------------------------------------------------------|----|----|----|
| † The account is stated in this way :—Undertaker's charge, he paying and finding labourers for the different operations | 3  | 10 | 0  |
| Picking, drying, and duty                                                                                               | 13 | 0  | 0  |
| Rent of land                                                                                                            | 1  | 0  | 0  |

Carried over 17 10 0



recourse is had to the use of the nidget, the expense will be a few shillings more, as is shown in the first estimate ;—the difference in favour of this practice from that where the planter procures and pays the workmen, being about one pound the acre \*.

The weather most favourable to crops of this sort, in the different stages of their growth, is that which is warm without much rain, and where south or south-westerly winds prevail; as the hop is a plant which never succeeds well in such seasons as are wet, or when either easterly or northerly winds continue for any great length of time during the summer months. Hot gleams of sun-shine after rain, or after foggy mornings, in the later summer months, also prove highly detrimental to these crops. High winds towards the approach of the picking season likewise produce considerable mischief, by bruising and otherwise injuring the hops. When unfavourable weather takes place, about the period in which the plants are in blossom, it is seldom that the produce is good or abundant, as many of the *burs* generally suffer in such a manner as to prevent their forming perfect hops.

In most cases the very forward binds suffer more from all the different accidents to which hop crops are exposed, than those that are later and of a less vigorous growth. It may, on this account, therefore, sometimes be adviseable to remove all the very forward binds.

These crops are exposed to the attacks of disease at almost every period of their growth. In the very early stage of the growth of the hop plant, it is liable to be wholly devoured, as it rises above the surface of the ground, by the ravages of the *flea*. And, in a more advanced state, it is subject to the still more prejudicial attack of the *green* or *long-winged fly*, *red spider*, and *otter moth*: the first of these, by the deposit of their ova, afford the means of producing *lice* in great abundance; by which the plants are often very greatly if not wholly destroyed, and the larvæ of the last prey upon the roots, and thus render the plants weak and

|               |   |   |   |   |   |   |   |   |   | £.           | s. | d. |
|---------------|---|---|---|---|---|---|---|---|---|--------------|----|----|
|               |   |   |   |   |   |   |   |   |   | Brought over |    |    |
| Poles         | - | - | - | - | - | - | - | - | - | 17           | 10 | 0  |
| Manure        | - | - | - | - | - | - | - | - | - | 6            | 0  | 0  |
| Tythe         | - | - | - | - | - | - | - | - | - | 2            | 10 | 0  |
| Bagging cloth | - | - | - | - | - | - | - | - | - | 0            | 10 | 0  |
|               |   |   |   |   |   |   |   |   |   | <hr/>        |    |    |
|               |   |   |   |   |   |   |   |   |   | 28           | 10 | 0  |
|               |   |   |   |   |   |   |   |   |   | <hr/>        |    |    |

\* Synopsis of Husbandry.



liable to be attacked by other diseases\*. The *boney dew* is likewise another disease to which the crops are exposed about the same time, and by which they are often much hurt. The *mould* or *fen* mostly occurs at a somewhat later period, but is equally prejudicial in its effects. There are still other injuries to which hop-crops are exposed, such as the *blight*, and what is termed the *blast*, which occur at different times, but mostly towards the latter periods of the growth of the plants.

The *flea*, which is asserted to be an insect of the same kind as that which is so destructive to the young turnip, is said to make the greatest havock in those seasons when the nights are cold and frosty, and the days hot and inclined to be dry. In its attacks it eats off the sweet tender tops of the young plants; and which, though they are not wholly destroyed by it, shoot forth afterwards in a much less strong and vigorous manner; from which they become more exposed to the attacks of other vegetable diseases. It has been remarked that this insect is the most apt to commit its depredations on the plants in those grounds that have received a proportion of dung the same year. And on the supposition that dung in its crude state has a tendency to encourage the production of this insect, it has been suggested that the manure employed for the purpose of covering the hills should be previously well mixed and incorporated with good fresh mould for a considerable length of time before it is made use of, as has been already directed; and that it should be applied either over the whole of the land, or only the hills, immediately after the plants have been cut over; the first is the most adviseable practice where manure can be easily obtained.

This insect commits its greatest depredations in the more early cold spring months, as the latter end of April and beginning of the succeeding month, disappearing as the season becomes mild and warm †.

The principal remedy in this case is that of having the land in a sufficient state of fertility, to enable the young plants to shoot up with such vigour and rapidity as to become quickly incapable of being fed upon and devoured by the insect. Stirring the mould about the roots of the plants by means of the hoe may also be of utility in the same intention.

The *green* or *long-winged fly* generally makes its appearance about the latter end of May, and in the two following months. The prevalence of north-easterly

\* Withering's Botanical Arrangement, Vol. II.

† Synopsis of Husbandry.



winds about the above period has much effect in producing these insects, which are very destructive of the young leaves of the plants. Under such a state of the wind they are said to scarcely ever fail covering the leaves; and by dropping their ova produce an abundance of *lice*, by which the crops are often much injured, as when they have once obtained complete possession of the plants they seldom or ever leave them before they are wholly destroyed. The forwardest and most luxuriant hop-binds are said to be in general the most disposed to be attacked by insects of this sort. The removal of the insects chiefly depends upon a change taking place in the wind from the above points more to the south, and the setting-in of mild and warm weather.

The *otter moth*, by producing its larvæ upon the roots of the plants, subjects them to be attacked by them, and the healthy growth of the hops to be in that way greatly impaired, the crops being of course much injured in respect to their produce. In this case, stirring the earth well about the roots of the plants may probably sometimes be serviceable.

The *honey dews* mostly occur after the crops have been attacked by some of the above kinds of insects, and when the weather is close, moist, and foggy. In these cases a sweet clammy substance is produced upon the leaves of the plants, which has the taste of honey. They have at first a shining appearance, but afterwards soon become black. The nature of this vegetable affection does not seem to be yet well ascertained. It is supposed by some to be the excrement of insects of the *aphis* kind, deposited by them upon the leaves of the plants after it has been extracted by their puncturing the leaves. Others however contend that it is a morbid exudation proceeding from the plants themselves; which is much more probable, and more consonant to analogy; since from its taste, which resembles that of the vernal sap-juice of plants, and its supporting bees, ants, and other insects, it must be of a nutritious quality\*. This supposition is rendered still more probable from the circumstance of its occurring after the insects have been some time present upon the plants, and disappearing long before they leave them†. It would appear indeed that this exudation may in some measure be caused by the punctures of the insects, as it most commonly takes place after the nights have been cold, moist, and foggy, and the succeeding days hot and sunny, the irritability of the plants being so much increased by the former as to render the action of the latter more powerful in promoting the circulation of their juices, and consequently in forcing their passage more abundantly through the fine openings afforded by the punctures of such insects.



This disease mostly happens in the more forward crops. The chief dependence of the planter for its removal is that of heavy thunder showers taking place, as by this means, when the destruction of the hops has not proceeded too far, they are often much restored, the insects that devour the leaves and binds being greatly destroyed, the growth of fresh shoots promoted, and a favourable bloom brought on\*.

The *fen*, *mould*, or *mildew*, is a disease to which the hop is exposed at a later period of its growth. It chiefly attacks the part where the hop is attached to the stem. Its production is greatly promoted by moist damp weather and a low situation; those hop-crops that grow on low, close, rich grounds being the most liable to be attacked by it. It is found to soon spread itself over the whole crop, after it has once seized upon any part of it. The nature of this vegetable disease is not probably yet perfectly understood. It has lately however been ingeniously suggested to be a plant of the fungus kind, that is capable of growing without light or change of air, attaching itself to the plants already in a morbid condition, and by its roots penetrating their vessels. On this supposition, the best remedy is believed to be that of thinning the plants, or wholly removing those immediately about it, in order to afford a more free circulation of air, and admit the light more extensively; by which the vigour of the hop-plants may be restored, and the disease be of course removed†. If this opinion of the nature of the disease be well founded, it is probable that by planting the hills more thinly, and making them at greater distances from each other, this vegetable malady might be in a great measure prevented from occurring in those situations where it most frequently shows itself.

*Blights* are frequent in hop-crops; but the causes of them do not appear to have been yet nicely investigated. They are found to happen at different periods of the growth of the plants, but most frequently in the more early stages of their rising from the hills, while the nights are cold and frosty in the spring months, and the days have much sun and heat. The living powers of the plants being in these cases greatly exhausted in the day-time by the stimulus of heat, may of course be much injured, or wholly destroyed in the nights, from being exposed to a freezing air, which is incapable of exciting the actions necessary to the preservation of vegetable life.

The *blast* is likewise a disease that hop-crops are exposed to, especially in the later periods of their growth. This is in general supposed by planters to depend upon or proceed from the particular state of the air or weather. It is more probable however that it may be the effect of lightning, as it occurs for the most part at those seasons when it is the most prevalent, and takes place in a very sudden

\* Synopsis of Husbandry.

† Darwin's Phytologia.



manner. And besides, lightning is known to produce similar effects on plants, by exhausting their irritability, and thus rendering their vital actions incapable of being excited by the ordinary powers that support them \*. This is rendered still more probable from the practical fact, that the most forward and most luxuriant binds are the most subject to be affected in this way. In exposures that are particularly liable to have the crops injured in this manner, it may be adviseable to keep back the growth of the plants as much as possible, by extirpating all the most forward shoots, as well as by employing a less proportion of the earthy compost in their culture. By having the plants to stand at greater distances than usual from each other, advantages may likewise probably be obtained.

In the former of these two last diseases, the presence of which is supposed to be much connected with the prevalence of winds from the northern or easterly quarters, there is frequently a *flea* produced of a similar kind to that which attacks the binds in their early growth. This is highly prejudicial by preying upon the *condition* of the hops, and thereby diminishing their weight, and changing them to a brown colour; which is of much injury in their sale †.

It is the practice in some districts for planters to sow turnips or set cabbage plants, or some other similar crops, in the intervals of crops of this sort; but it is an injudicious method, which should seldom or never be attempted, as the hops may be greatly injured by being thus deprived of their due nourishment and support, as well as of the full aëration of the soil, which can only be effected by the operations of frequently stirring and turning over the particles of the mould; which under such circumstances can never be properly performed. Besides, as such crops must prevent the hop-plants from being kept so perfectly clean and free from weeds as might otherwise be the case; and cannot admit of the turnips or other crops being eaten off upon the land, or of being drawn and carted away, without much injury being sustained by poaching and the treading down of the hills; it is much the best way to exclude every sort of secondary crop from the plantation.

The advantages of the cultivation of hops have been differently stated by different cultivators; some contending that it is beneficial in a very high degree, while others are equally positive in affirming that it is a sort of culture that only affords a very trifling profit. It is evident however that in many situations the growth of this plant must be extremely beneficial, though, like most others, it must be subject to vary, according to the circumstances of soil, culture, and climate. Experiment has indeed shown, that on the deep boggy soils, after being rendered

\* Darwin's Phytologia.

† Synopsis of Husbandry.



sufficiently dry, the black vegetable moulds and rich loams, it is a culture that answers to a very high degree; and that, under other circumstances of a much less favourable nature, it is so profitable as to far exceed common husbandry \*. It may indeed be concluded, that though on lands that are perfectly adapted to these crops, and so situated as to afford poles, manure, and labourers for performing the business of picking and other operations in sufficient proportion and at reasonable rates, they may be highly beneficial both in respect to the immediate money profit they afford, and the great improvement that is accomplished in the lands from the nature of their culture; yet under other circumstances, from their precariousness, and their being attended with much trouble, it may be better either to wholly omit them, or only cultivate them on a limited scale. And where they are cultivated in connection with farms, it should only be to such an extent as that no injury may be sustained by the other parts either in tillage or manure †.

*Woad.*—This is a plant which has a thickish strong fibrous root that penetrates to a considerable depth in the soil. It is principally cultivated for the leaves, which, after being properly manufactured, are employed in the art of dyeing in order to produce a blue colour, and also as the basis of black and some other colours ‡.

From the nature of its root it obviously requires a soil which has much depth, and which is perfectly fresh. Those of the rich, mellow, loamy, and putrid vegetable kinds are in general the most adapted to it. In Lincolnshire, where its culture is carried to a considerable degree of perfection by some cultivators §, the deep, rich, putrid, alluvial soils on the flat tracts extending upon the borders of the large rivers are chiefly chosen for the growth of this plant. And experience has shown that it succeeds in the most perfect manner when they are broken up from a state of sward immediately for its reception. It is frequently the practice of cultivators of this plant to take lands of this description at high prices, for the purpose of breaking them up and growing it upon them for a few years;—on the more low rich soils, sometimes for four years, but in those of less fertility only for three; and in some which are more elevated and exposed in their situations, two is thought sufficient ||; persons accustomed to this sort of culture, who move from place to place and form a sort of colony, being engaged in the business. It has been found however, by the ingenious cultivator mentioned above, to be capable of being confined to one spot with equal or more success, by having a sufficient extent of ground, for changing the place of its growth as may be necessary, and for appropriating an

\* Young's Eastern Tour. † Kent's Hints. ‡ It is the *Isatis tinctoria*, or dyer's woad.

§ J. Cartwright, esq. of Brothertoft, near Boston. || Corrected Agricultural Report of Lincolnshire.



adequate proportion annually to the raising of the plant, by which the houses and machinery that are necessary for its preparation may be kept regularly in employ.

In preparing the land, it is recommended by some to plough it up with a good deep furrow, just before the winter commences, laying it in narrow high ridges that it may have the full effect of the frosts. Early in the spring another ploughing should be given in the contrary direction, leaving it in the same kind of ridge as before. After it has remained in this state some time, and weeds begin to appear, it must be well harrowed down with a pretty heavy harrow, repeating the operation as frequently as may be necessary to render it perfectly fine and clean. In the beginning of June a third ploughing should be performed to the full depth with a narrow furrow, the land being afterwards well harrowed down as in the former cases. And about the end of July or the beginning of the following month the final ploughing must be given, which should be light, and the surface left as even as possible for the reception of the seed\*.

Other cultivators, however, take much less trouble in this business. Where the soils are sufficiently dry, they break them up early in the month of February; but where the contrary is the case, it is deferred to a later period. In performing the work, great care is taken to plough it in a perfect manner to the depth of about five inches. And in order that the furrow-slices may be well turned, laid flat, and nicely jointed, a person is employed in the furrows with a spade for the purpose. This is found requisite to prevent the grassy matters from rising in the seams. After this the surface is repeatedly harrowed over, in order to raise a sufficient depth of good mould for the drill to work in; and before the seed is put in a roller is passed over it†.

This method is probably however inferior to that first described, as the land cannot be brought by it to nearly so fine a state of mould, or the grassy material be so effectually destroyed; it will therefore be apt to rise and injure the woad plants.

But there is still another method which is more expeditious, and at the same time equally effectual with the first; and which has an advantage over it in more completely destroying the grubs and insects which are apt to feed on the plants in their early growth. This is that of paring and burning. It is however chiefly practised where the sward is rough and abounds with rushes, sedge, and other coarse plants.

After this, in the last two methods, the land is to be carefully drained by making grips in suitable directions, by means of the spade, as wherever water stagnates the woad plants are sure to be destroyed‡.

*Seed.*—This is collected from a portion of the ground that has been left covered

\* Martyn's Edition of Miller's Dictionary, art. *Isatis*.

‡ Corrected Agricultural Report of Lincolnshire.

† Ibid.



with the best plants from the preceding season, as they only run up to stem and produce seed in the second year. It is sometimes a practice to crop the leaves of the plants that are intended to stand for this purpose, two or three times in the first season; but this is an improper custom, as they are thereby much weakened in their growth, and not only afford a less quantity of seed, but such as is of an inferior quality. It is a better method either not to crop them at all, or but once, as by such management, seed of the most perfect quality may be obtained. The stem should be suffered to remain till the seeds in the husks become perfectly ripened; which is known by their attaining a brownish yellow colour, and the pods having a dark blackish appearance. The seed should then be gathered as soon as possible, which is best performed by reaping the stems in the same manner as grain, and then spreading them in rows thinly upon the ground if the weather be fine; when in the course of a few days they will be in a condition to be threshed out from the husks. When they are suffered to remain too long, the pods are apt to open, and shed the seed. The husk or pod, in which the seeds are included, is of a large size, but the seeds less than those of the turnip. It is always the best to sow new seed, when it can be procured, in preference to such as has been kept for some time; when of the latter kind, it should be steeped for twelve or fifteen hours before it is sown.

In respect to the proportion that may be necessary to be sown upon an acre, it must depend much upon the soil, and the manner in which it is sown. Where the drill is employed, less will be necessary than in the broad-cast method. A rood of land, where the crop is good, will in general afford seed sufficient for eight or ten acres. In some places six bushels are made use of to the acre, in the broad-cast method\*.

*Time and method of sowing.*—The period of putting crops of this sort into the ground must depend in some measure upon the method of preparation that has been adopted. Where the first of the methods that have been mentioned is followed, it must be much later than in the other cases. Early sowing is in general to be preferred, as there will be less danger of the plants being destroyed by the attacks of the *fly* or *grub* †. When the weather is suitable, and the land in a proper state of preparation, the seed may therefore be sown in the latter end of February or in March, continuing the sowings, in different portions of land, till about the middle of May, at suitable intervals, to vary the times of cropping the leaves of the plants. The late sowings are generally performed about the latter end of July, or beginning of the following month.

\* Corrected Agricultural Report of Northumberland.

† Laurence on Agriculture and Gardening, folio edition.



The manner in which the seed is put into the ground is different, according to the nature and state of preparation of the land. When it is in a fine state of mould, the drill, or row method, is the most generally practised, and is by much the best, as the plants may be kept more easily clean from weeds, and become more vigorous from the earth being more stirred about the plants: but where the contrary is the case, the broad-cast plan is mostly followed; though it does not by any means admit of the plants being kept so free from weeds, or of the mould being so well stirred about them.

In the first method, the seed is put in by a drilling machine, such as is employed for turnips, in equi-distant rows, about eight or nine inches apart, being covered either by means of a harrow which is attached to the implement, or by passing a light common harrow over it afterwards once in a place; and if there be any clods, they should be raked off to the sides, or into the furrows. In the latter mode, it is dispersed by the hand in as equal a manner as possible over the whole of the land, being then harrowed in by a light harrow, so as to leave the land in as even and level a state as possible. In either way the land is frequently rolled afterwards, in order to leave the surface as even and neat as it will admit of.

When the season is favourable and the seed is of a good quality, the plants mostly appear in the course of a fortnight; when much attention should be paid to them to see that they are not destroyed by the *turnip-fly*, or the frosts in those of the more early sowings; as, where that is the case, the land should be immediately sown again. In some places it is not uncommon to sow the greatest part of the crops two or three times over. And in the very late sowings, where the crops are thin on the ground, it is sometimes a practice to render them more thick by forming holes with a triangular hoe in the vacant spaces, and directing persons to drop seeds into them by the hand\*: women and children may be employed in this business. This mode is often practised for the late spring sowings till the beginning of June, or even later.

*After culture.*--As the goodness of the woad plants depends upon the luxuriance of their growth and the thickness of their leaves, much attention is necessary to the after management of the crops. In the spring-sown crops, as well as those that are put-in in the latter part of the summer, the first hoeings should be performed as soon as the plants are fully distinguishable; as by this means the weeds will not only be prevented from retarding the vegetation of the plants, but these, by being thinned out to greater distances, will be more at liberty to advance, and become vigorous in



their first growth, which is a matter of great importance to the success of the crop. In the second hoeings, which should be given in the course of four or five weeks after the first, the plants are to be thinned out to the full distances at which they are to stand, which may be six or seven inches, or more, according to the fertility of the soil, always leaving sufficient spaces to prevent the plants from being in any way crowded. This business is in some cases executed in the same manner as for turnips, by means of hand-hoes; but in others it is performed by small short *spuds*, managed with one hand, while the other is employed in clearing away the weeds; the labourers, who are mostly women and children, kneeling while they are at work. After this nothing more is done till the first cropping of the leaves has been performed, when the plants are again immediately well weeded; and after each cropping the same operation is had recourse to; the extent of crop cleared in the day being, in most cases, weeded before night\*.

In the late mode of sowing, after the second weeding in October, nothing further will be requisite till the spring, about the middle of April, when the work should be again well executed, the mould being fully stirred about the roots of the plants, in order that they may derive the fullest advantage from the process. This will be sufficient to keep the plants clean till the taking of the first crop; after which the plants must be again weeded, and the same operation be performed after each cropping of the leaves of the plants, as in the former case.

The expense of performing this business will be different in different cases; but where labourers are in sufficient number, the first hoeing will mostly be done at about six or seven shillings the acre, and the succeeding ones at about half the price, provided it be executed before the weeds have risen to too great a height. In many places, the business of weeding and cropping the leaves of the plants is performed by the same persons, at a fixed price for the acre, according to circumstances.

*Gathering the crop.*—In the spring-sown crops the leaves are generally ready to be gathered towards the latter end of June or beginning of July, according to the nature of the soil, season, and the climate. But when put in at a later period in the summer, the crops are often fit to be gathered earlier. This work should, however, always be executed as soon as the leaves are fully grown, while they retain their perfect green colour and are highly succulent; as when they begin to turn

\* Corrected Agricultural Report of Lincolnshire.



pale much of their goodness is expended, and they become less in quantity and of an inferior quality.

In performing the business, a number of baskets are provided in proportion to the extent of crop, and placed in the field, into which the leaves are put as soon as they are taken from the plants, which is done by the hand, by grasping them firmly and giving them a sort of twist. On good soils, in favourable seasons, the plants will often rise to the height of eight inches or more; but in other circumstances they seldom attain more than four or five: and where the lands are well managed, in respect to the culture of the plants, they will often afford two or three gatherings; but the best cultivators seldom take more than two, which are sometimes mixed together in the manufacturing of them. The after croppings, when they are taken, are constantly kept separate from the others, as they would injure the whole if blended together, and considerably diminish the value of the produce. The best method, where a third cropping is either wholly or only partially made, is to keep it separate, forming it into an inferior kind of woad. The produce upon an acre of land, when well managed, in favourable seasons, is mostly from about a ton to a ton and a half. The price varies considerably; but for woad of the prime quality it is often from twenty-five to thirty pounds the ton, and for that of an inferior quality six or seven.

In the parts of the crops that are reserved for feed, it is a practice with some cultivators to crop the leaves two or three times the first year, and then leave the plants to run up to seed in the following; but it is a better practice to only remove the side leaves, as in this way the plants are less weakened, and the produce of seed is much greater. The plants are likewise sometimes fed down by sheep during the winter season; but this, from its tendency to weaken them, is equally improper.

In the preparation of the woad several processes are necessary after being gathered into the baskets: it is, in the improved method, conveyed in one-horse carts, so contrived as to be lifted from the axis, and, by folding doors in the bottoms, to discharge their contents upon the floor above the mill, on being hoisted up to their proper situation: round this floor holes are formed for putting the plants down through, in order that they may drop under the grinding wheels. The mills for this purpose have several wheels for grinding the plants, which have less diameters on one side than the other, and are about three feet in width, being constructed with iron bars for crushing the woad. They are wrought by horses, or any other power, as may be the most convenient. The materials are



preserved under the grinding wheels by proper contrivances, which, as soon as they are sufficiently reduced, force it out of the tracks upon the stone floors on the sides; thus making way for new parcels without the mill being stopped. The bruised woad is then thrown into rooms on the sides of the mill, destined for its reception, by means of shovels. In these it remains till the juice is so much drained off as to leave it in a proper condition for being formed into balls; which is done by labourers, with apparatus for the purpose, and then laid upon trays to be conveyed to the drying ranges, in which they are placed upon grating shelves that slide on ledges in the drying houses. These are placed on the sides of galleries for the convenience of being easily placed upon them and removed again. It is kept in these till it is sufficiently dried to be laid up in other rooms, until the whole of the crop has undergone the same operations, and the workmen are ready to manufacture it.

In order to prepare it for use in the art of dyeing, it is necessary for it to take on a proper state of fermentation. This is accomplished in the course of seven or eight weeks, and, in the technical language of the art, is termed *couching*. It is effected by regrinding the balls, in the same mill as before, to a fine powder, and then spreading it upon the floors of the rooms in which the balls were formed, to the thickness of about three feet; where it is then moistened with water, so as to keep it in a proper flow state of fermentation; and so managed by turning as that it may pervade the whole in an equal manner. In this business the direction of an experienced workman is necessary. In the turning, it is of much importance that the parts of the materials be perfectly divided, which can only be effected by a nice management of the shovel\*.

Much advantage has been found in the goodness of the woad, from the drying and storing of it being performed in a careful manner. When this attention is neglected, the woad will not, on being broken between the finger and thumb, draw out into fine hair-like filaments, or, in the language of the manufacturer, *beaver* well; as the use of this substance, in the blue vat of the dyer, is not merely to afford the colour of the plant, but, by bringing on a very gentle fermentation, excite the indigo in the same vat to yield its colouring principle more perfectly. This is even necessary for its own colouring matter being fully imparted. The substance should therefore be so prepared in the different operations as to produce this effect in the most certain and perfect manner. When the heat in the process

\* Young's Corrected Agricultural Report of Lincolnshire.



of *couching* has gone too far, the substance will be what is termed *foxy*; and when it has not proceeded to a sufficient degree, it will be what is called *heavy*. If the material be good, it does not soil the fingers on being rubbed between them; but such as is heavy does. In the conclusion of the process, the cooling is effected in so gradual a manner as to render it not fit for taking on the same process; and of course proper for being preserved in casks, or in any other way. It is then ready for use \*.

This is a sort of crop that appears best adapted to the rich fertile lands that are on these accounts, on being first broken up, unfit for oats or any other sort of grain-crop, as it may in these cases be had recourse to for a year or two, when they will be in a proper clean state for grain; as, from its not returning any thing to the land, it must of necessity be in some measure an exhausting crop: but it does it in a more moderate way than many other sorts of deteriorating crops; and at the same time, from the nature of its culture, leaves the land in a more clean and perfect condition for the growth of other crops.

The ingenious cultivator mentioned above has introduced this plant as a regularly returning crop in the rotation of woad for two, three, or four years; then oats for one or two years; after that cole, then oats again; the land being then laid down to grass, with white clover, rib grass, a slight portion of trefoil, the best hay-seeds, some parsley, and a little ray-grass. Land left in this way, if constantly fed down with sheep and a few neat cattle, it is supposed, would be in a condition to be planted again with woad in the course of seven or eight years †.

But as the demands for this article are in some degree confined, it is not a sort of culture that can be extended in an unlimited manner. Besides, as there is much risk and anxiety attending the cultivation and preparation of such sorts of crops, and a great expense of machinery, it is probable that many other kinds of root and other crops that are less exposed to hazard in their growth, and trouble in their preparation and after-management, may be grown on soils that are proper for this plant, with more profit and advantage.

Where the culture of the plant is however established, and the necessary apparatus provided, its cultivation, by confining it to a particular place, and introducing it in a regular course as just stated, may be extended, and rendered more easy and profitable.

*Weld.*—This is another plant that is cultivated for the sake of its flower-stems,

\* Young's Corrected Agricultural Report of Lincolnshire.

† *Ibid.*



which are employed in the art of dyeing, for the purpose of producing the bright yellow and lemon colours \*.

The soils most adapted to the culture of this plant are those of the more fertile mellow kinds, whether of the loamy, sandy, or gravelly descriptions; but it may be grown with considerable success on those of a poorer quality. In the former, the plants will however rise to a much greater height, and produce much larger leaves, than in the latter.

In the preparation of the ground, it is necessary that there should be a considerable degree of fineness produced in the mould. This may be effected by different ploughings performed in the more early spring-months, and by occasional harrowing. In giving the seed furrow, the land should be left in as even and level a situation as possible on the surface, in order that the seed may be dispersed over it in a more equal and regular manner.

*Seed.*—It is necessary that this should be collected from the best plants, and that it should have remained upon the stems till it has been rendered perfectly ripe; as that which is not well ripened never vegetates well. The plants designed for seed should not, however, be let stand too long in the field, as the seed is liable to shed; and it should be perfectly fresh when sown, as that which has been long kept never comes up well, or in so even a manner. As the seed is very small, the surface mould, by being left in a fine condition, is more fit for its being dispersed over it equally. The proportion of seed that is necessary is generally from about two quarts to a gallon the acre, according to circumstances, where it is sown alone; but when mixed with other crops a little more may be required. It should be mixed with a little sand at the time of sowing it.

*Time and method of sowing.*—In this, as in the preceding crop, the seed may be put into the ground either in the spring, as about the latter end of April or beginning of May; or in the close of the summer, as about the beginning of August; but in the former periods, it is mostly sown in conjunction with other crops. But when sown alone at the latter season, the produce is in general the most abundant.

This sort of crop is commonly sown broad-cast, whether it be grown in mixture with other plants or alone; and as the seeds are of a very small size, it requires an expert seedsman to perform the business with regularity and exactness; which is a matter of much importance to the success of the crop, as, where the plants

\* It is the *Reseda Luteola*, and is commonly known by the names of *Woold*, *Weld*, and *Dyer's Weed*.



stand too closely together, much unnecessary trouble and expense must be incurred in the thinning them out by the hoe afterwards; and where they stand too thinly upon the ground, there must be great loss from the deficiency of plants. In order that the sowing may be executed with more regularity, it is the custom with some cultivators to blend some other substance with the seed that has nearly the same weight, such as that which has been just noticed, as, in this way, they suppose it to be effected with greater facility and dispatch.

Where the weld is grown with other sorts of crops, as barley, buck-wheat, beans, peas, clover, or grass seeds, it is put in after them; in some cases immediately, but in others, not till some time has elapsed. With the first and second, when sown so late as the beginning of May, it is mostly the practice of the best cultivators to put it in directly afterwards, giving the land a slight harrowing with a very light close-tined harrow, to cover it\*. With some, the barley being put in under furrow, the weld seed is immediately sown upon the surface, lightly harrowed in, and then rolled†. But where the barley seeding is performed so early as March, or the beginning of April, the sowing of the weld seed is best deferred till May, when it may be dispersed over the land, and left in that manner to be washed in by the rains‡. But with beans and peas, it is often put in before the last braking or hoeing of the crops in the latter end of June, or beginning of the following month§. When cultivated with clover and grass seeds, it is sometimes put in at the same time with them; but it is probably a better practice to delay it till some time afterwards, as both these crops require to be sown at too early a period for this plant.

Where no other sort of crop is grown with the weld, the usual method is that of sowing it evenly over the surface of the land, and covering it in by harrowing with a light common or bush-harrow, finishing, when the soil is of the light kind, by passing a roller over it.

*After-culture.*—In the common practice of cultivating crops of this sort, no attention is afterwards paid to them. But as the plants are of slow growth, and of course liable to be greatly injured in their progress by the rising of weeds, it must be of much advantage not only to keep them perfectly clean from them, but also to have the mould stirred about the roots of the plants. In the course of about a month from the time of sowing, the plants are mostly in a state to be easily distin-

\* Synopsis of Husbandry.

† Annals of Agriculture, Vol. I.

‡ Ibid.

§ Corrected Agricultural Report of Kent.



guished; a hoeing should, therefore, be then given when the weather is dry, which may be performed in the same manner as for turnips, making use of somewhat smaller hoes for the purpose. It is advised by some to set the plants out, in this operation, to the distance of three or four inches; but it will probably be better to let them have more room, as six, seven, or eight inches; which will not only lessen the expense of the business, but contribute to the advantage of the crop. When this operation is well executed, nothing further will be necessary till the spring, when a second slight hoeing may be practised about March, in a dry time; and if any weeds rise afterwards, a third may be performed in May. But where the land has been well prepared, one in the autumn and another in the spring may be fully sufficient. In some cases hand-weeding is practised, but it is in general too expensive a method.

The most proper time for pulling this sort of crop is when the bloom has been produced the whole length of the stems, and the plants are just beginning to turn of a light or yellowish colour; which is usually about the beginning or middle of July in the second year. The plants are usually from one to two feet and a half in height. It is thought by some cultivators to be advantageous to pull it rather early, without waiting for the ripening of the seeds, as by this means there will not only be the greatest proportion of dye, but the land will be left at liberty for the reception of a crop of wheat or turnips\*. In this case, a small part must be left solely for the purpose of seed.

In performing the business the plants are drawn up by the roots in small handfuls, which are usually set up to dry, after each handful has been tied up by one of the stalks, in the number of four together in an erect position against each other. Sometimes they, however, become sufficiently dry by turning without being set up. After they have remained till fully dry, which is mostly effected in the course of a week or two, they are bound up into larger bundles, that contain each sixty handfuls, and which are of the weight of fifty-six pounds each: sixty of these bundles constituting a load†. These last are tied up by a string made for the purpose, and sold under the title of *would cord*.

As the weld plant is extremely uncertain in its growth, and the whole crop seldom becomes in a state to be pulled at the same time, it is necessary to have an experienced labourer to direct the business of pulling, in order that the pullers may not proceed at random, but take the different parts as the plants become ready,

\* Martyn's edition of Miller's Dictionary, art. *Reseda Luteola*.

† Synopsis of Husbandry.



or in danger from the blight. In this last case the greatest possible dispatch should always be made, as the loss of weight in the produce will daily increase, and the grower be of course greatly injured.

When the weld is sufficiently dried, which may be known by the crispness of the leaves, and the stems turning of a light colour, and when the plants are ripe, the seeds shelling out; according to some, it should be stacked up lightly in the barn in order to prevent its taking on too much heat\*; while others advise, that it should be stacked up closely in the manner of wheat, being left to sweat in the same way as hay, as the more this takes place the better; the quality of the weld being thereby increased, if there be no mouldiness†.

If the crop has stood till it is perfectly ripe, the seed may be taken before it is put into the barn, which may be easily procured by rubbing, or slightly beating each of the little handfuls against each other over a cloth, tub, or any other convenient receptacle, as, by threshing, the quantity of the weld would be much reduced in weight. The price of this sort of seed is mostly about ten or twelve shillings the bushel, which may be sold to the seedsmen.

The produce of crops of this kind is in some degree uncertain, much depending upon the nature of the season; but from half a load to a load and a half is the quantity most generally afforded, which is commonly sold to the dyers at from five or six to ten or twelve pounds the load, and sometimes considerably more. It is mostly bought by persons who afterwards dispose of it to the dyers occasionally as they find it convenient. The demand for it is sometimes very little, while at others it is so great as to raise the price to a high degree. The expense of cultivating this sort of crop has often been estimated below one pound the acre; but that is much too low where proper attention is bestowed in preparing the land, and in the hoeing and other management of the crop afterwards. Without taking in the value of the land, tythes, or other charges, it must constantly stand much higher‡.

\* Synopsis of Husbandry.

† Carter in Annals of Agriculture, Vol. I.

‡ Without any regard to the preparation of the land or the crop with which it is blended, where that mode of culture is adopted, it may stand thus per acre:

|             | Expenses.    | £.    | s. | d. |
|-------------|--------------|-------|----|----|
| Seed, &c.   | - - - - -    | 0     | 1  | 3  |
| Sowing      | - - - - -    | 0     | 0  | 3  |
| Two hoeings | - - - - -    | 0     | 7  | 6  |
|             |              | <hr/> |    |    |
|             | Carried over | 0     | 9  | 0  |



Crops of this kind are particularly liable to be injured by the *blight*, which is probably the reason that has induced cultivators to raise them with those of other sorts, especially those of the grass kind, as by that means, where the weld does not succeed, a portion of sheep-feed may be afforded for winter and spring use.

The blight frequently comes on so suddenly, that crops which appeared healthy and in a vigorous state of growth during the winter and spring, promising a large produce, are about the month of May attacked so as to be nearly destroyed. It is known by the plants, especially about the lower parts of the stems, turning of a yellowish or pale reddish colour, while the upper parts remain green and seem healthy. When it appears early in the month of May there is always danger of the crop being destroyed; but when it comes on at a later period, or where the plants from other causes, as the dryness of the season, begin to change colour in the stalks, the only chance is that of having them pulled as expeditiously as possible.

Although the practice of sowing weld with other crops has been common, it would seem more proper to cultivate it alone, as in that way it must be much injured and restricted in its growth, from the great closeness and shade produced by the plants that surround it. The only objection to the cultivating of it alone is, as has been just seen, in the danger of the crop being destroyed by the blight, in which case the farmer will have nothing left to repay him for his expense and trouble; whereas, when grown with other crops, they may in such cases in some measure defray them\*.

It is usual with the cultivators of weld when it is grown with other crops, especially those of the grass kind, to feed them down, in the winter and spring, with sheep or other sorts of live stock, under the notion that they will not touch the weld plants: but this is not the fact, as they are found to feed upon them, and must of course be greatly injured in their growth: caution must therefore be used in directing the feeding down of clover or other crops where the weld plant is present.

|                                           |   |   |   |   |   |              | £.    | s.    | d.    |
|-------------------------------------------|---|---|---|---|---|--------------|-------|-------|-------|
|                                           |   |   |   |   |   | Brought over | 0     | 9     | 0     |
| Pulling the crop and tying it in handfals | - | - | - | - | - |              | 0     | 8     | 0     |
| Binding into bundles                      | - | - | - | - | - |              | 0     | 1     | 6     |
| Woold cord                                | - | - | - | - | - |              | 0     | 1     | 0     |
| Carting and stacking                      | - | - | - | - | - |              | 0     | 3     | 0     |
|                                           |   |   |   |   |   |              | <hr/> | <hr/> | <hr/> |
|                                           |   |   |   |   |   |              | 1     | 2     | 6     |

\* Synopsis of Husbandry.



There can be little doubt but that crops of this sort may be cultivated with much profit in some cases, where the soil is adapted to its growth, and from its nature not disposed to the blight, or to lose its moisture too much in the summer months; but under the contrary circumstances its culture should not be attempted. Besides, from the great consumption of vegetable matter which it causes, without contributing any thing in the way of manure to the land, it can only be introduced with propriety, perhaps, in situations where manure can be easily obtained\*. In these cases, where the crops are cultivated with sufficient attention, it may be a good preparation for wheat or turnip crops.

When the weld cannot be disposed of soon after it is pulled, it may be preserved perfectly good several years by being put up in stacks, either in the barn or the open air, care being taken to keep it from being injured by the attacks of rats or other vermin.

*Madder.*—This is another plant of the perennial kind, that is sometimes cultivated in large plantations in the field, for the sake of its long thick fleshy root, which is employed in the art of dyeing, for the purpose of giving a scarlet colour†. It was formerly much more cultivated in particular districts than it is at present; the importations from Holland having lessened the demands, and reduced the price of it so much as to render its culture incapable of being conducted with profit to the farmer.

The soils the most suited to the cultivation of this plant are those of the deep fertile sandy loams that are not retentive of moisture, and which have a considerable portion of vegetable matter in their composition. It may also be grown on the more light descriptions of soil that have sufficient depth, and which are in a proper state of fertility.

In the preparation of the land for the reception of the crop, it will be necessary to plough it up deeply before the winter into high ridges, in order that it may be exposed to the action and influence of the frosts. Early in the spring these ridges should be well harrowed down by a heavy long-tined harrow, and then ploughed again in the contrary direction to a good depth; and when, after this, it is not perfectly clean from weeds, or not rendered sufficiently fine and mellow, another ploughing and harrowing may be given. In the last operations, the ground should be left in as level a state as possible. It is then ready for the reception of the plants.

\* Marshall's Rural Economy of Norfolk.

† It is the *Rubia tinctoria*.



*Sets.*—The plants may be obtained either by sowing the seed upon a bed of earth which is rich, and made perfectly fine by digging and raking, in the spring, it being lightly covered in, or from offsets or suckers from the old plants. In the first method, on the plants appearing they should be made perfectly clean by weeding, and be set out to the distance of three inches in the beds by the hoe. In this way, by keeping the ground quite clean and well stirred about the plants they will be ready to set out in the second autumn, though it will mostly be better to defer the business till the spring. The latter practice is the better in this climate, if the sets can be procured, as the plants seldom ripen their seed perfectly, or afford it in a state to vegetate well. It requires about twenty thousand plants for setting an acre of land.

*Time and method of planting.*—The proper time of taking the sets is shown by the plants having obtained the height of ten or twelve inches from the ground, and the suckers having thrown out fibrous roots at their bottoms. This may be seen by drawing up a few of the plants, and is usually about the latter end of May or beginning of June. It is quite necessary that the sets have formed root-fibres at the bottoms before they are removed, as where that is not the case they scarcely ever succeed well.

The plants being in this situation, and the land prepared as before directed, a sufficient number of labourers are to be provided, that the work may be performed as expeditiously as possible. In taking off the sets, much care is necessary not to injure them. Some perform it by means of a dibble with a flat edge, and which is shod with iron: this tool, on being thrust into the ground on the side of the shoots, divides and separates them by depressing the handle, without hurting the fine fibrous roots. The number of plants that can be set in a short space of time should only be taken up at once. They should be prepared by having about a third of their top parts cut off. A sort of thin batter should likewise be made by mixing good vegetable mould and water well together, into which the roots of the sets should be dipped before they are placed in the earth, as by this means the necessity of watering the plants afterwards is prevented. This work is executed by a person before the planting commences. Two others are employed afterwards in distributing the plants so as to be convenient for putting into the ground\*.

There are different methods employed in setting the plants: in some cases they are put in the furrows by means of the plough, while in others they are set in beds

\* Corrected Agricultural Report of Kent.



by a dibble. The former is probably the better method, and, as being the most expeditious, is the best adapted to the culture of the plant on an extensive scale. In this, the planter begins by drawing a straight furrow on one side of the plantation to a good depth: a row of plants are then laid in it by a person for the purpose, at the distance of five, six, or more inches from each other, according to the circumstances of the land, in such a manner as to lean off from the plough: another furrow is then formed, by the mould of which they are covered. In this manner the work proceeds until the whole is finished.

In the other method the sets, after the land has been formed into beds five feet in breadth, with two feet between each for intervals, are put in by means of a line and dibble, beginning at the distance of six inches from the outsides, and setting a row of plants at suitable distances from each other, as just mentioned; then removing the line two feet further on them, and putting in another row; after which it is again removed two feet, and a third row of plants set in, which finishes the bed; the work proceeding in the same manner till the whole of the plantation is completed. In this way, each bed contains three rows of plants at two feet distance each, three feet being left between the rows on the different beds.

In Holland, where the culture of this root is extensive, their method is a little different from the above. The plants, after being taken from the older plantations about the month of May, are immediately set in rows at the distance of three or four inches from plant to plant, and about fifteen inches from row to row, the beds being ten or twelve feet in width, with intervals of only about two feet.

As, in whatever manner the plants are set, some of them even in the most favourable seasons are liable to die soon after the work has been performed; it is necessary in the course of a fortnight or three weeks to look over the ground, and put fresh vigorous plants in the places where the others have been destroyed. By this means the plantations may be rendered more perfect and productive.

*After-culture.*—Whichever method of planting is practised, it is of the greatest consequence to the success of the crop that it be kept perfectly clean from weeds, and that the mould be occasionally stirred about the roots of the plants. The first is accomplished by means of hand-weeding and hoeing, during the summer season; and the latter, either by the use of a hand-hoe or a light plough. This last is the most easy and expeditious. In this manner, or by digging the intervals of the rows, the mould is also laid up to the plants once each year, after the stems have been removed in the autumn season\*. Where the bed practice is followed, they

\* Corrected Agricultural Report of Kent.



are sometimes earthed up in the autumn, after the stems have been cut down, by paring the intervals somewhat in the manner of those of the asparagus kind. This method is however, in general, too expensive and troublesome where the plantation is extensive.

The crops are to be managed in this manner until the third autumn after planting, when the plants will be in a state to be taken up. This is known by their stalks beginning to wither, and is generally about October. This business is performed either by trenching the land over with a spade, or by means of the plough. The first is the more certain though much less expeditious method. In executing it, the workmen dig along the rows to the depth of about two feet, breaking and reducing every spit of earth as perfectly as possible; each being attended by two persons who pick out the roots of the madder. But when the planting has been done in narrow beds, it is sometimes the practice to take the roots up, by turning the earth into the intervals by a *spud*, or broad three-tined fork. In this way it is supposed that the roots are taken up more perfectly, and with less danger of being injured. But the most ready method is by means of the plough, which, after having the earth-board and coulter removed, is passed along each side of the rows, so as fully to loosen the mould; persons being employed to pick out the roots, loosening such parts of the earth as may have escaped the action of the plough by their spades.

When the roots have been taken up, they should be exposed some time to the air, in order that they may be rendered so dry as to be cleared from the mould. They are then to be conveyed to a kiln, such as is employed for the purpose of drying malt or hops, where they are to be brought into such a state of dryness as to be perfectly brittle: this is done to prevent the danger of their being injured by becoming mouldy, or from running into a state of fermentation; but much caution is necessary in conducting the process. After this they are packed up in bags, in order to be disposed of to the dyer, who reduces them into a powder, by a mill, before they are made use of as a colouring ingredient.

The best madder is that which, on being broken, has a brightish-red or purplish appearance, without any yellow cast.

In order to collect the seed of the madder plant, it is necessary to let the plants remain in the field till the seed is almost wholly ripe, which is generally in the month of September: the heads are then to be separated from the stems, and exposed on a cloth in the sun till the seed can be easily forced out by slightly beating them. It is then to be rendered perfectly clean, and afterwards placed in a sunny



situation until it is become quite dry; for if the least dampness remain it will grow mouldy, and its vegetative power be either greatly impaired or wholly destroyed. When thus properly dried, it should be put in small bags, and hung up to the ceiling of a room where a fire is constantly kept.

The produce from the root of this plant is different, according to the goodness of the soils, but mostly from ten to fifteen or twenty hundred weight where they are suitable to its culture.

It seems probable that the cultivation of madder might be rendered a profitable article of field husbandry in different districts, if the importation of the root from Holland was prohibited; as the event of different trials has shown that full crops of good madder are capable of being raised. It is supposed by an intelligent cultivator, that if the price was never lower than three pounds the hundred weight, it might be grown not only with profit by the farmer, but without injury to the consumer\*.

From the high degree of culture which land under this sort of crop must necessarily undergo, and its not being so much exhausted as in many other cases, it must be an excellent preparation for wheat or any other crop that requires a clean and fine pulverized condition of the ground.

*Teasel.* This is a plant of the thistle kind, which is cultivated in the field in some districts for its use in the dressing of cloths, the head being constituted of different well-turned vegetable hooks†.

The soils most adapted to the culture of this plant are those of the more strong and deep kinds, but which are not too rich, as loamy clays, and such as have marley bottoms and are fit for the growth of wheat crops. If broken up from the state of old ley, it is the better; but wheat stubbles are sometimes made use of for the purpose.

The situations the most favourable are those that are rather elevated, open, and incline to the south. The high grounds, especially where the country is inclosed, are the most advantageous, as the natural superabundant moisture in the heads of the plants is more completely dissipated in wet seasons, which in other more low situations is apt to lodge so long upon them as to cause them to decay.

In the preparation of the ground when it is a ley, the best method is to plough it up deeply in the beginning of the year, as in the first part of February; and where

\* Boys's Corrected Agricultural Report of Kent.

† It is the *Dipsacus Fullonum*, or Fuller's Thistle.



it is inclined to the retention of moisture, this should be done in narrow ridges of about three bouts each, the furrow slices being laid as even and regular as possible, the fine mould from the furrows being raised by the plough or spade so as to cover the surface. But in lands that are sufficiently dry, and which are broken up from stubble, the ploughing may be deferred to a later period, and be laid in ridges of much greater breadths and more flat. In either case the surface should be left in as fine a state of mould as possible for the reception of the seed.

*Seed.*—In collecting the seed, it should constantly be taken from such plants as are the most perfect of their kind and the most productive in heads, as there is much difference in the quantity that is afforded by different plants, some producing nearly a hundred, while others do not afford more than three or four\*. It should be suffered to remain till it becomes perfectly ripened, and be used while fresh, as such as has been long kept seldom vegetates in a perfect manner.

The proportion of seed that is mostly employed on the acre is from one to two pecks†, but some make use of a larger quantity. It is disadvantageous, however, to sow the seed too thick, as the plants are injured in their early growth by standing too closely together.

*Time and method of sowing.*—Crops of this sort are commonly put into the earth about the beginning of April. As the seeds vegetate in the most expeditious and perfect manner when put in while there is a considerable portion of moisture in the soil, the sowing should never be deferred much longer than this period.

It is mostly sown in the broad-cast method evenly over the surface, in the manner that is practised with turnips. But before this is performed the land should be well harrowed down, in order to afford a fine state of mould as a bed for the seed. It is then to be covered in by a slight harrowing with a light short-tined harrow.

This sort of seed may likewise be sown in rows in the drill method, at the distance of eight, twelve, or more inches, from each other, in the same way as that of the turnips. This method is not, however, much employed by those who are in the practice of raising teasel crops.

*After-culture.*—As much in the cultivation of crops of this kind depends on the land between the plants being kept perfectly clean and free from weeds; in having them set out to proper and sufficient distances; and in having them well earthed up, it is necessary that the cultivator should see that these operations are performed in

\* Billingsley's Corrected Agricultural Report of Somerset.

† Ibid.



a perfect manner. The digging between the plants is usually executed by means of spades which have long narrow bitts not more than about four inches in breadth, having the length of sixteen or eighteen inches. With these the land is commonly worked over in the intervals of the plants three or four times during the summer months; and about the beginning of November, when they stand too closely together, they should be drawn out, in order to fill up any vacancies that may have occurred. When there are still too many plants remaining, it is sometimes a practice to prepare another piece of ground, into which these are transplanted. It is, however, found that those plants which are never removed produce the best heads\*.

In the ensuing winter, as about the latter end of February, the land between the plants is to be again worked over by the narrow spades, care being taken that none of the mould falls into the hearts of the plants. And about the middle of May, when they begin to spindle, another digging over is given, the earth being raised round the root-stems of the plants, in order to support and prevent them from being blown down by the wind. Some cultivators perform more frequent diggings, that the ground may be rendered cleaner and more mellow; consequently the growth of the plants be the most effectually promoted†. This business is commonly termed *spaddling*, and is executed with great dispatch by labourers that are accustomed to it: the use of the hoe has been attempted by some in performing it, but without success‡. After these diggings nothing further is necessary till the period of cutting, which is generally about the month of July, which is known by some of the uppermost heads beginning to blow; as, when the blossoms fall, they are ripe, and in a state to be cut.

This is a work that should be performed as the heads become ripe; but is mostly executed at three different times, at the distances of about ten days or a fortnight from each other. It is done by means of a knife, contrived for the purpose, with a short blade and a string attached to the haft. This last is done in order that it may be hung over the hand. A pair of strong gloves is likewise necessary. Thus prepared, the labourer cuts off the ripe heads along the rows, with about nine inches of stem, and ties them up in handfuls with the stem of one that is more perfectly ripened. On the evening of the day on which they are cut, they should be put into a dry shed; and when the weather is fine and the air clear, they should be taken out, and exposed to the sun daily till they become perfectly dry. Much

\* Corrected Agricultural Report of Somerset.

† Ibid.

‡ Ibid.



care must however be taken that no rain falls upon them. In doing this, some make use of long small stakes or poles, on which these handfuls are hung.

After being completely dried, they should be laid up in a dry room, in a close manner, till they are become tough and of a bright colour, and ready for use. They are then to be sorted or separated into three different kinds, by opening each of the small bundles. These are distinguished into *kings*, *middlings*, and *scrubs*, according to their different qualities. They are afterwards made into packs, which, of the first sort, contain nine thousand heads, but when of the second twenty thousand; the third sort is of very inferior value \*. By some, before forming them into packs, they are done up into what are termed *aves*, by means of split sticks.

The produce in crops of this nature is very uncertain, there being sometimes fifteen or sixteen or more packs on the acre; and at others scarcely any. The produce is disposed of to the cloth manufacturers in Somersetshire, Wiltshire, and Yorkshire, and in general averages about forty shillings the pack. From the circumstance of the land being under the necessity of being kept in a high state of pulverization and cleanness, the expenses of cultivation must be considerable †.

This kind of crop is extremely precarious, as the plants, especially when the season proves wet about the time of blossoming, are liable to rot and be destroyed.

The uncertainty of teasel crops has induced the cultivators to blend other plants with them the first year, such as beans, &c. in order to repay them in some measure for the great expense of tillage and keeping the land clean: but this is

\* Corrected Agricultural Report of the County of Somerset.

† Mr. Billingsley, in his able Agricultural Survey of Somersetshire, estimates them in the following manner:

| Expenses per Acre.                                                |           | £. | s. | d. |
|-------------------------------------------------------------------|-----------|----|----|----|
| Two years' rent                                                   | - - - - - | 3  | 0  | 0  |
| Ploughing                                                         | - - - - - | 0  | 15 | 0  |
| Workmen's labour in digging, &c.                                  | - - - - - | 3  | 15 | 0  |
| Making out in bundles, tying together, and bands, at 2s. per pack | - - - - - | 0  | 14 | 0  |
|                                                                   |           | 8  | 4  | 0  |
| Profit                                                            |           | 5  | 16 | 0  |
|                                                                   |           | 14 | 0  | 0  |
| Average Produce.                                                  |           | £. | s. | d. |
| Seven packs at 4cs.                                               | - - - - - | 14 | 0  | 0  |

In this estimate tythes and taxes are not however valued.



a practice that should be avoided as much as possible, as the growth of the teasel plants must constantly be injured by it.

From the nature of the soil, the preparation that it undergoes in rendering it fit for the growth of the plants, and the fine state of pulverization and cleanness that it is kept in by the after-culture which is necessary, it becomes well adapted for the reception of a wheat crop after the teasels are removed, and which may mostly be put in on one ploughing. But as the teasel robs the soils on which it is grown of a considerable portion of their fertility, as is evinced by its succeeding the most perfectly on lands that are newly broken up from the state of old sward; it may not be adviseable to follow it by such grain-crops, except when the grounds are very rich; but to interpose some sort of green crop, either of the bulbous-rooted or stem kind.

*Liquorice.*—This is a plant sometimes cultivated in the field for the sake of its roots, which are made use of for various purposes. It is a hardy perennial of the deep-rooted kind. The species mostly grown is the common sort\*, the roots of which are said to be more sweet and juicy than those of the others. An open situation is always to be preferred for this plant.

The soils most suited to the growth of the liquorice plant are those of the deep light sandy loams, as the goodness of the crops depends upon the roots penetrating to a considerable depth.

The preparation of the land is effected either by the spade or the trench-plough; but the first is the more perfect method. In either way the ground must be well loosened to the depth of three feet or more, the autumn before the planting is intended; and a sufficient proportion of well rotted dung then intimately incorporated with the mould. In this state the land is to remain till the time of planting, when another stirring of the earth must be performed to the same depth, the mould being left as light as possible.

The land being thus prepared, it is necessary to provide a sufficient quantity of sets. These should be taken off from the sides or heads of the old plants, care being taken that each of them have one or two good eyes or buds, and that they be perfectly sound. They should be about ten inches in length.

*Time and method of planting.*—The best season for putting the sets into the ground is in the early part of the spring, as soon as the frosts are over, as about the latter end of February or beginning of March.

There are different methods of putting the plants in, some preferring the setting them on the plain surface, while others have recourse to small beds. On soils

\* The *Glycyrrhiza glabra*.



that are dry and porous, the first may be the most advisable practice; but in such as are retentive of moisture the bed method may be preferable.

In the first mode, the sets are usually put in by means of a line, with a dibble of considerable length, in rows at the distance of two feet from each other, and one foot or more in the rows; the shoots being put in straight downwards, so as to be covered over about one inch with earth on the top. Where the intervals between the rows are sufficiently spacious, there are considerable advantages in the cultivation of the roots, as the earth may be stirred and kept clean at little expense by means of the plough; and at the same time the roots will have room to attain a more full growth.

Where the planting is performed in the latter method, it is the practice in some districts to put the sets in on beds three feet in width raised into ridges\*. In both these methods, it is the custom with many to sow, at the time the planting is executed, some small seed-crop, such as onions. In the bed method they are sown in the alleys: but though in this way some advantage may be immediately gained, without much care in removing them from about the liquorice plants, they will be prejudicial to their growth: besides, they prevent the land, in the intervals of the rows and alleys, from being stirred and kept in a perfectly clean state,—a circumstance on which much depends in the culture of the liquorice root.

*After-culture.*—It is highly necessary that the plants be kept free from weeds by repeated hoeing and hand-weeding during the summer months; and towards October, after the onions or other crops, where they are grown, have been removed and the land been well cleaned, a slight covering of well rotted dung should be applied. In this state the plants may remain until the following March; when the ground between the rows, or in the alleys, must be lightly stirred, either by digging or the plough, in order to promote the growth of the plants. Some likewise advise the tops of the liquorice plants to be annually cut over†. These methods are to be pursued till the third year after planting, when the roots will be in a condition to be taken up; but which should not be performed until the stems are wholly decayed, as when raised too early they shrink greatly and decrease much in weight.

The method of taking up the roots is generally by means of trench digging to the full depth of the roots, which is mostly about three spits in depth.

In executing the work three workmen generally follow each other with spits, be-

\* Corrected Agricultural Report of the West Riding of Yorkshire.

† Ibid.



ginning on the outside of the rows with the trenches, the last having a mattock to assist him in raising the roots. After the roots are taken up, they are thrown on the ground on the sides of the trenches. The same method is pursued with each of the rows until the whole crop is taken up. In some cases, the land in these trenchings is left in such a state as to be ready for replanting.

The small lateral roots are then trimmed off, the largest being cut into proper lengths for new sets, and the main roots tied up into bundles for the purpose of sale.

This sort of crop can only be cultivated in a local manner, as it requires land that has great depth of soil, and which possesses considerable fertility. Besides, it is in some measure exposed to uncertainty, being liable to become rotten in wet seasons, and to be much injured in its growth by frosts in the spring, and dry weather in the succeeding months. As the value of this root depends much upon its being kept in a succulent state, and there is considerable loss in weight by its being kept dry, it is the most adviseable practice to dispose of the produce immediately after it is taken up; but where this cannot be done, it should be deposited in a moist situation till it can be sold.

Having thus described the methods of culture that appear the most advantageous in the different sorts of field-crops, we shall consider the modes of cutting, harvesting, and securing, that are the most economical, and best adapted to those of the corn kind.

*Cutting and Harvesting Grain Crops.*—The times and methods of cutting down grain crops, as well as those of harvesting and securing them, vary considerably in different districts, and under different circumstances and kinds of corn. In some, as those of the midland and more southern counties, the harvest commences early, as towards the latter end of July or beginning of August; and the grain is chiefly cut by means of short stiff scythes\* constructed for the purpose, with bows of small sticks, or what are sometimes termed *cradles*, fixed to the handles in such a manner as to deposit the heads or ears of the corn, as much as possible, in one direction. In this practice, the produce is frequently bound up into a sort of sheaves or bundles; while in cases where the naked scythe is made use of, the binding is but rarely attempted, the crops being merely raked together, and put in small heaps, till they are in a proper state to be secured in the barn or stack-yard.

But in most of the more northern districts, and in Scotland, where the cutting

\* The scythes used for cutting grain crops should neither be so long or so thin in the edges as those employed in mowing grass, as it is not necessary to take so great a breadth; and where the edges of the scythes are thin and fine they are liable to be broken by the stiffness of the straw.



of the grain begins at a much later period; as about the middle or latter part of August, the business is chiefly performed by means of the sickle or reaping-hook; the handfuls, as soon as cut, being placed upon bands made by twisting a few of the stems together at the ear ends. These are mostly afterwards bound up into sheaves of different sizes, according to the nature of the situation and climate.

In this mode of cutting and binding the grain, it is mostly set up into what are provincially termed *stooks*, *stouks*, *shocks*, or *battocks*, which is accomplished by setting six, eight, or ten sheaves together, with the tops or ear ends inclining against each other; after which the whole is capped, or covered over, by dividing two sheaves quite up to the bands and slipping them over the others, in such a manner as that their butt ends may meet in the middle, while the ear ends spread fully over the upright sheaves, and preserve them from the wet. These top sheaves, from the manner in which they cover the others, are termed *hooders*.

In almost every situation, both in the southern and the more northerly parts of the kingdom, the wheat and rye crops are however cut by the sickle or the reaping-hook, as it is scarcely possible to cut them with a scythe without considerable loss. And besides, it is of great advantage, in respect to the straw, to have the crops bound up into sheaves in a regular manner. Sometimes a hook which is sharp on the edge, but without teeth, is made use of: the labourer, in performing the business, hooks up the grain towards him. This in some districts is termed *baging*.

In the cutting of grain crops, whether by the scythe or the sickle, there is much difference in different places, in the height at which the operation is performed. In some it is the practice to mow or reap the crops as close to the surface of the ground as it can be conveniently executed; but in others, eight, ten, fifteen, or more inches of stubble are left.

There are advantages and inconveniences attending the cutting of grain crops, both in the scythe and sickle method. The first has the advantage of being expeditious, and at the same time of being capable of being executed with any degree of closeness that may be required; but it leaves the produce in an irregular and uneven situation, which renders it not so fit for being bound up into sheaves. And besides, where the corn is very ripe, it may be more liable to be shed during the operation, when performed in this manner. It is, however, often the practice, where corn is cut by the scythe, to have it bound up into sheaves, as well as to let it remain in the swaths until it is ready for the stack; but where the former is the case, the grain is mostly mown inwards towards the crop, the cut grain resting against



the standing corn; while, in the latter, it is cut outwards, and formed into swaths in the same way as with grass.

Where the sickle is employed, the crop is placed with more exactness and regularity, and of course is capable of being bound up with greater ease and facility. And it is probable that there is less loss of grain incurred in the operation. The business is, however, more tedious and difficult of execution in this way than by the scythe.

It seems obvious therefore, that where labourers are scarce the former method must be the most adviseable; but where the contrary is the case, it may be the most advantageous to have recourse to the latter.

In regard to the height of cutting grain crops, as the stubble which is left in mowing or reaping them is not only nearly useless to the land, but frequently so troublesome in the culture of it afterwards as to be under the necessity of being removed; it would appear to be the best and most economical practice, in either case, to have them cut as close as the nature of the ground will admit. By this means the agricultor will not only have more litter at command for the bedding of his yards, stalls, and other places, and consequently an increase of manure, but have the business more expeditiously performed, and with much less waste of the grain; and at the same time be freed from the trouble and expense of removing the stubble\*.

It has been shown by careful experiment made with the view of ascertaining the difference between high and low cutting, that there is much advantage in favour of the latter mode†. In this trial, four ridges in the same field, apparently equal in quality, were two of them reaped close by the surface of the ground, and the other two at some height, though not so high as in the general practice of the district. Each of the portions was found to measure something more than a quarter of a Scotch acre, which is more than a fifth larger than that of the English statute acre.

The produce was then set up separately into *stouks*; and the length of time that eight reapers took to the part that was cut *low*, was found to be one hour and twenty-four minutes; and that taken up by the same number, in the part cut *high*, only forty-eight minutes. The expense in wages was eighteen-pence each the day, and that of maintenance six-pence. The result of the experiment on the grain

\* Donaldson's Modern Agriculture, Vol. II. and Perthshire Agricultural Report.

† Corrected Agricultural Report of the West Riding of Yorkshire.



being threshed out and measured, and the straw weighed, was found to be greatly in favour of low cutting \*.

In order to facilitate the business of cutting grain, different attempts have been made to construct machines for the purpose; but hitherto we believe without complete success. An implement of this kind, which could perform the operation in an easy, correct, and expeditious manner, would be of vast importance to the arable farmer in this uncertain climate, especially as the difficulty of procuring a sufficient number of labourers in such busy seasons has been lately much increased.

In respect to the proper period of cutting the different kinds of corn, it is best shown by the appearance of the crops, as when the grains are become plump and well filled, and the greenness in a great measure removed from the straw and ears by the bleaching effects of the oxygen of the atmosphere, it will in general be necessary to begin the business of cutting. It is, however, the best practice in most cases to begin before the crops are too ripe, especially when the scythe is made use of, as there will be less danger of waste. And the business should always, if possible, be performed when the crops are perfectly dry; as when cut down while wet, they are extremely liable to become mouldy, and injure the sample. Whether the scythe or sickle be made use of in cutting grain crops, it is probably the most judicious and safe practice to bind the produce up into sheaves. It has been remarked by an experienced agricultor, that there are many advantages resulting from it: the waste of grain is much less; the crop is

\* It is thus stated in the Agricultural Survey of the West Riding of Yorkshire:

*Result.*

|                                                                                                              | £. | s. | d. |
|--------------------------------------------------------------------------------------------------------------|----|----|----|
| Eight shearers (reapers) one hour and twenty-four minutes, at 2s. per day,<br>or 2½d. per hour               | 0  | 2  | 4  |
| Same number of labourers, 48 minutes                                                                         | 0  | 1  | 4  |
| Difference of expense in favour of high cutting                                                              | 0  | 1  | 0  |
| Or per acre                                                                                                  | 0  | 4  | 0  |
| One peck and a quarter of wheat more from the low cut portion than that cut<br>high, at 1s. 4d. the peck, is | 0  | 1  | 8  |
| Fourteen stones (22 averdupois pounds) more of straw, at 2d. per stone, is                                   | 0  | 2  | 4  |
|                                                                                                              | 0  | 4  | 0  |
| Or per acre                                                                                                  | 0  | 16 | 0  |
| Deduct the increased expense of cutting, and there will remain in favour of low<br>cutting per acre          | 0  | 12 | 0  |



more quickly placed out of danger from the weather; the labour of carrying, housing, or stacking, is greatly lessened; the straw, in wet seasons, is much better for the purposes of cattle-fodder, and the grain preserves its colour far better. On the whole, it is likewise concluded that the quantity of labour is rather diminished than increased: besides, the business of threshing, especially where the work is performed by the machine, is thus rendered much more easy and expeditious\*.

The loose method of harvesting, if practised at all, can only be employed in the more southern districts, where the harvest commences at an early period, and where the climate is mild, regular, and steady†, as there must under other circumstances be much danger from the crops being so fully exposed to the weather.

In the binding of grain crops, middling-sized sheaves are constantly to be preferred to those that are very large, as there is not only less danger of their becoming mouldy within, but they are more easily penetrated by the winds and dried by the sun. In tying the bands, care should be taken that they do not slip too much towards the ear ends of the corn; and that they be made sufficiently tight for the straw not to slide through them during the time of setting them up in the field, conveying them to the barn or stack, or in the operation of stacking; as, where this is not properly attended to by the workmen, there is often much trouble and inconvenience afterwards from the sheaves falling asunder.

Wheat and rye crops, as being mostly free from weeds and having the straw but little imbued with moisture, will only require to be exposed to the influence of the sun and air for a short time, as a few days, in order to render the grain plump, slippery, and a good sample. Much may be effected in this way, by spreading out and exposing the grips, handfuls, or any small portions of the crops, as they are cut down, to the full action of such powers, turning them occasionally, and carefully binding them up before the evening dews fall upon them. A very little rain is capable of making these crops grow, and thereby injuring the value of the grain. It is generally the practice in these cases to set the sheaves up during the sunny part of the day on their root ends, putting them into *hattocks* during the night. In this way they soon become fit for the barn or stack.

But in barley and oat crops, as well as those of the pulse kind, a much longer time is requisite in the field to prepare them for being put up either in the barn or the stack. The necessary length of time will depend much upon the cleanness of

\* Marshall's Rural Economy of Yorkshire.

† Modern Agriculture, Vol. II.



the crops from any weedy or grassy matters. After being cut, they must remain, according to the manner in which the operation has been performed, for such a length of time in the field as is sufficient to render the stems of the grain, as well as any grassy material they may contain, in such a state of dryness, as that when closely stacked up they will take on little or no heat; as, where the contrary is the case, the grain is liable to be spoiled by becoming *mow burnt*, or greatly injured in the colour of the sample.

Where the grain is reaped by the sickle, the produce is often placed loosely upon the bands in the day, and tied up into sheaves towards night, being then set up into *battocks*. These, when the weather is fine, especially if the season be wet, are exposed to the action of the sun and air by taking off the hood, or cap-sheaves, in the daytime, carefully replacing them as the evening approaches. In bad weather the root ends of the sheaves are likewise turned up towards the sun.

And in mowing corn crops, where they are afterwards bound into sheaves, a similar method is pursued in bringing them into a proper condition for being piled up in stacks. In executing the business it is usual for the mower to be followed by a woman and boy, the latter of whom prepares the bands, while the former, with a long-toothed wooden rake having a short handle, collects the cut grain into parcels about the sizes of sheaves, depositing them in a quick easy manner in the bands, without stooping or touching them with her hands. The mower having proceeded to the end of the swathe, binds them up as he returns, placing them either upon their root ends, or setting them into *stooks*; and in the mean time the stubble is raked over by the woman in so clean a manner that scarcely a stem is left: this is performed with much ease and expedition where the land has been well harrowed over and rolled at the time the crop was put in.

A reaping fork is sometimes made use of for collecting it into sheaves. This is constructed with two prongs below, somewhat in the manner of the common hay fork, to which are added at the upper part two upright prongs, by means of which the grain is removed from the swathe and collected into sheaves, the lower prongs raising it up while the upper ones prevent its falling backwards, and determine the quantity which is proper for the sheaf. By this simple contrivance the grain may be gathered more regularly and much more expeditiously into sheaves than by mere hand labour. After the grain is become perfectly dry by exposing it to the sun and wind in the manner described above, it is put into the stack.

This method of cutting and harvesting grain would appear to be better than that of reaping, as being much more expeditious, and consequently reducing the num-



ber of labourers that would otherwise be necessary, and which in many situations are difficult to be procured.

The neatest harvest work is, however, made by the sickle, and it is probably the best method where a sufficient number of hands can be procured. The sickle with teeth should be employed in preference to the *reaping-hook* with a cutting blade, which is used in some places, as it is a much more expeditious and convenient tool, and performs the business in a much better manner.

Where the corn crops are cut by the scythe and secured without being bound up into sheaves, the swathes are in some cases repeatedly turned over till they become sufficiently dry to be put into the stack; but in others, after being a little dried in the swathes, they are formed into a sort of heaps, or cocks, in which they remain till they are ready to be carried into the barn or the stack-yard. As soon as they have attained this state, they are conveyed as quickly as possible to the barn, or stack, a number of labourers being employed to rake over the ground. The method of harvesting grain crops in this case has much similarity to that pursued in the hay harvest. It is, however, a slovenly wasteful practice, which does not by any means deserve encouragement, as there must constantly be great hazard of securing the produce when the season is not favourable.

Besides these methods, when the harvest is late and unfavourable, and the difficulty of preserving the grain greatly increased, others are sometimes had recourse to, such as *gaiting* and *butting* the corn. The first of these operations is chiefly practised when the crops are cut late and in a wet condition, and is performed by tying the sheaves in a rather loose manner in the usual place, and then slipping the bands up to the ears. They are afterwards set down on the ground on their root ends, in so forcible a manner as to give them a good basis to rest upon: with experienced labourers, the hand is then thrust down through the middle of the sheaves, by which the butt ends are spread out and the central parts left open and hollow, more especially those that face towards the south; as, by that means, the air and the rays of the sun enter and pass through more freely, from which the grain is better and more quickly preserved and rendered fit for the mow or the stack\*.

The *butting* of grain in the field is mostly had recourse to in late wet harvests, and is a practice often attended with much success in the more northerly climates, especially when it can be accomplished while the corn is in a tolerable state of dryness, immediately after being cut and bound into sheaves. The huts are formed by

\* Modern Agriculture, Vol. II.



building the sheaves together in such a manner as to shoot off the wet as much as possible, to the height that the labourer can reach as he stands upon the ground, being so narrowed up as that they may be covered at the tops by a sheaf or two, spread out so as to let the water readily pass away. They generally contain from about twelve to twenty *shocks*, in proportion as the straw is more or less bulky. When thus properly constructed, the grain may be preserved, however bad or long-continued the harvest season may be. Grain managed in this way has been found, on the *buts* being taken down after they had been exposed to the most severe and heavy rains of the worst harvest seasons for five or six weeks, in an astonishing state of preservation, little injury having been done, except to a few of the top sheaves; while that in fields adjoining not treated in the same manner, though carefully set up in stooks and hooded, was completely grown and matted together, so that each stook was a connected mass of vegetable vegetating matter\*. This fact shows the advantage of the practice in the most clear and satisfactory manner, in districts where the harvests are protracted to a late period, and the weather on that account apt to be wet and unfavourable.

After the grain has been rendered, by some of these modes, perfectly dry and in a proper situation for the stack or mow, no time should be lost in carrying the crops. In performing the business, whether carts or waggons are made use of, the grain is mostly put upon them by labourers stationed in the fields for the purpose; and after they have been brought home, are forked up to the stacks, &c. by the drivers.

The wheat-crops are in many districts chiefly preserved in the barns. This is particularly the case in the midland and south-easterly counties, where they are large; but in various other parts it is the practice to build this sort of grain, as well as those of barley, oats, peas, beans, &c. into stacks in yards contrived for the purpose†. This last method, when properly performed, is probably the best and most convenient, as the grain is not only more secure from vermin, but preserved much more free from mustiness, and at the same time capable of being got at with more ease and facility. Besides, the vast expense and inconvenience of the buildings are not only avoided, but the danger of exposing the corn longer out in the field than would otherwise be necessary obviated, and the waste of grain by shedding, in consequence of such dryness, in loading and carrying, in a great measure prevented‡.

*Stacking of Grain Crops.*—It is a common practice, when grain is secured in

\* Modern Agriculture. Vol. II.

† Ibid.

‡ Farmer's Magazine, Vol. III.



stacks, to allow it to be deposited upon a basis formed of large pieces of timber or other kinds of wood, and filled up in the middle with brush-wood faggots, or any other materials of a similar nature, a little straw or litter being thinly placed over the whole. This is, however, a dangerous and slovenly method, that ought never to be attempted by the correct agricultor. It is a much safer, better, and upon the whole a more economical practice, where this mode of preserving corn is in use, to have the stacks built upon frames constructed of wood, stone, or brick. When constituted of the first sort of material, they are usually raised upon stone pillars or supporters, to the height of from two to two feet and a half, the tops being capped or covered over with flat round stones of considerable dimensions, so placed as to prevent the entrance of vermin. But when made with stone or brick, they are built to the same height as in the former case, in a rather slanting manner outwards, and covered on the tops with copings of oak planking or flat stones, which project over the edges several inches, and in that way prevent the depredations of rats and mice on the grain, as well as their lodging in the stacks. In both cases, pieces of timber are placed as a frame in the middle to support the grain.

The first of these sorts of *corn-stands* is in general the best, as being more easily as well as more cheaply constructed, and at the same time permitting the air to enter and circulate with more freedom underneath, in the bottom of the stand.

In respect to the form of these stands, it varies according to that in which the stacks are made, which is different in different districts. The circular and oblong forms are the most usual; but the long narrow shape is probably to be preferred, as it is said to keep the corn better, more dry, and freer from heating\*. It is an advantage in this sort of stands that the crops, especially those of the wheat, may be carried and stacked upon them much sooner after being cut than in other circumstances†. They have likewise the advantage of preserving the grain in a more sweet condition, when kept till the following summer, or for a greater length of time.

Though very different forms are in use in building corn stacks, those of the long, narrow, square shape are probably the most advantageous where the quantity of grain is considerable; as they stand more firmly, have a better appearance, are more conveniently built, and preserve the corn better than those of other forms. Besides, they require less thatch as well as labour in putting it upon

\* Corrected Agricultural Report of Northumberland.

† Ibid.



them. But where the grain is only in a small proportion, the round or oblong shape may be more proper and suitable, as being more readily drawn up in the roof. The circular with a conical top and cylindrical body, diverging a little at the eaves, is esteemed the best form, by some\*.

In the building of the stacks the stems should be suffered to swell outwards, in a very gradual manner, quite up to the eaves, and not be brought up in a perfectly upright or plumb method, as is the case in some districts; as by this means they will not only be more effectually secured from the penetration of moisture, but require a less extent of stand. And if well built, they stand with equal firmness and solidity. The proportions that ought to be preserved in their construction, are in general about two-thirds of the whole, or something more, for the stems, and one-third for the roofs; but the difference of form may admit of slight variations in these respects.

The sizes of stacks of this sort must of course vary considerably according to circumstances; but they should never be made too large, as there is a great deal more risk in securing and getting in the grain for them; and from their being built at different times, they do not settle all together in so perfect a manner, or resist the effects of the weather, and keep the grain so well as those of less dimensions, that can be completed at once. Besides, they are more inconvenient in threshing out, especially where the flail is employed. The only advantages they possess are those of taking something less in thatch and labour in covering them. In general, from about twenty to thirty two-horse cart-loads may be sufficient for one stack.

Where grain is stacked loose, in the manner of hay, it is the common practice to have several persons upon the stack as for hay, the corn being forked up and placed on the sides all round in a similar manner; after which other parcels are laid round on the inside of these, so as to bind them in a secure manner from slipping outwards; proceeding in the same way till the whole middle space is well filled up; when the operator commences another course in the same method, and goes on in this mode, course after course, till he has formed the whole of the stem; when he begins to take in the roof, in a very gradual manner, in every course, until he brings the whole to a ridge or point, according as the stack is formed. In order that the roofs may throw off the water in the most perfect manner, they should be suffered to have a slight degree of fulness or swell a little about the middle, and not be made flat, as is frequently the case.

But where the corn is bound into sheaves, seldom more than one person is em-

\* Corrected Agricultural Report of the County of Perth.



employed in performing the business of building the stack, except where the dimensions are very considerable; in which cases it is found necessary to have a boy to receive the sheaves from the pitcher, and hand them to the man who builds the stack. In executing this work it is of the greatest importance that the centre of the stack be constantly kept in a somewhat raised state above that of the sides, as by this means the sheaves have a sloping direction outwards, by which the entrance of moisture is more effectually guarded against. To accomplish this in the most perfect method, it is the best practice for the operator to begin in the middle of the stand or staddle, setting the sheaves together, so as that they may incline a little against each other, placing the rest in successive rows against them till he comes to the outside, when he carries a course of sheaves quite round, in a more sloping manner than in the preceding courses. Having thus formed the bottom of the stack, it is afterwards usual to begin at the outside, and advance with different courses round the whole, placing each course a little within the other, so as to bind them in a perfect manner, till he comes to the middle. Different courses are to be laid somewhat in the same way, till the whole of the stem is completed; when the last outside row of sheaves is, in some cases, laid a very little more out than the others, in order to form a sort of projection for the eaves. Where the stem of the stack is however formed in the manner advised above, this may be omitted without any inconvenience, as the water will be thrown off without touching the waste of the stack. The roof is to be formed by placing the sheaves gradually a little more in, in every course, till it comes to a ridge or point, according to the form of the stack. In making this part of the stack, great care should be taken to give the ear-ends of the sheaves a sufficiently sloping direction upwards, in order that they may be the better secured from wetness. And the outside should be well rounded, in the manner that has been directed above.

Where proper attention is bestowed in building corn-stacks in this way, every sheaf in the whole will have such a sloping position outwards of the stack, or towards the root-ends of the sheaves, as will afford the most perfect security against damp and moisture\*.

In stacking wheat-crops, these directions require more particular attention; as the sheaves should have a rather more sloping direction when placed in the stacks, on account of the tallness of the straw, in order that they may be the better secured against the injurious effects of damps.

It is of much convenience and advantage, in the stacking of grain as well as hay,

\* *Farmer's Magazine*, Vol. III.



to have a large sheet or sail-cloth to place over them in case of showers or bad weather, while they are building, and before the thatch is put on; as where this convenience is not at hand, much injury is frequently sustained at these times by the sudden falling of rain.

It is the practice in some districts, especially where the stacks are made of a circular form, and the weather is wet and unfavourable, to have a funnel or chimney left in them, in order to prevent their taking on too much heat. This is effected by tying a sheaf up in a very tight manner, and placing it in the middle, on the foundation of the stack, pulling it up occasionally as the building of the stack proceeds all round it. And in setting up ricks in bad harvests, it is a practice in some places, particularly with barley crops, to have three or four pretty large poles tied together, by winding straw ropes round them, set up in the middle, round which the stacks are then built. Where grain stacks are not placed upon elevated frames or stands that are open in the bottoms, it may be useful in some cases to leave one or more openings in the lower parts of the stacks, that there may be a free circulation of air underneath them\*. But except the stacks are large, or the grain when put into them in an imperfect condition, such openings are quite unnecessary†.

It may likewise be useful, in building large corn ricks, to have a *stacking stage*, so contrived as to be capable of standing close to their sides, and by that means enable the workman to pitch the sheaves with more ease and convenience to the persons employed in forming the stacks. An easy contrivance of this sort will be described in speaking of the methods of stacking hay.

*Thatching of Grain Stacks.*—In the thatching and trimming of corn-stacks, considerable experience, ingenuity and art is necessary, in order to perform the business in a complete manner. The most suitable material for the purpose is good wheat-straw that has not been much bruised in threshing out the grain. But when this cannot be had in sufficient quantity, rye-straw may be substituted in its place; which, however, from its rough and stubborn quality, is neither so neat in its appearance, so durable, nor affords so secure a covering. Barley and oat straw are sometimes made use of for the purpose; but they form very indifferent coverings, and such as are not by any means lasting.

There is still another material that may be made use of with propriety and ad-

\* Farmer's Magazine, Vol. III.

† In the northern parts of the kingdom, they are denominated *faeces*.



vantage in some situations. This is the stubble of such wheat-crops as have been cut at a great height; which, after being mown close to the ground and raked up, serve the purpose very well.

In preparing these substances for application, after being well moistened with water, they are drawn out in handfuls perfectly straight and even into regular lengths, and the short straw separated, leaving them placed in convenient bundles to be carried to the thatcher.

In the application of the thatch, different methods are pursued according to the nature of the materials employed. When long straw is made use of, the operator usually begins at the eaves or bottom of the roof, depositing it in handfuls in regular breadths till he reaches the top; the different handfuls being so placed endways as to overlap each other, the upper ends being constantly pushed a little into the bottom parts of the sheaves. In this manner he gradually proceeds, breadth after breadth, till the whole of the roof is covered, which is usually done to the thickness of about four or five inches. And in order to retain the thatch in its place, short sharp-pointed sticks are occasionally thrust in, in a slanting direction upwards, and sometimes small sticks sharpened at the ends are bent and thrust in along the top parts and sides. But as the water is apt to follow the course of the sticks, it is a better practice to make use of ropes of twisted straw for this purpose. In some cases these are applied only round the bottom parts of the roof and the sides; while in others, which is a much better and more secure method, they are applied in such a manner over the whole stacks as to form a sort of coarse network nine or twelve inches in width in the meshes; the ends being well fastened, either to belt ropes passed in suitable directions for the purpose, or to different parts of the straw of the stack. This method of tying on the thatch should constantly be practised where the stack-yards are much exposed to the effects of the wind, as without such precaution great injury may frequently be sustained.

Where stubble is used in the way of thatch, it is put on by sticking one of its ends into the roof of the stack, in a regular and exact manner, so as that it may stand very close and thick; the other, with such loose straws as may occur, is then cut over, or pared off with a very sharp tool, for the purpose, so as to form a neat and impenetrable thatch, having the appearance of a newly thatched house\*. It is well secured in its place by short pegs made for the purpose.

In whatever way the thatching of corn-stacks is performed, it should never be

\* *Modern Agriculture*, Vol. II.



attempted until they have fully settled; as where the contrary is the case it is sure to rise into ridges afterwards, and by that means admit the water to pass down into them.

The expense and trouble which attends the thatching of corn-stacks has been brought as an objection by some against the practice of setting grain up in that method; but it is not by any means necessary, in order to have them neat and secure, to bestow either so much labour or materials upon them as to justify such an objection, though it may be done in some instances. As they are seldom designed to stand for any great length of time, it is quite sufficient that they be thatched in such a manner as to effectually prevent the entrance of water, and so secured that the winds cannot disturb them. To have the work performed in any other way would be totally incompatible with that dispatch which is constantly requisite at such seasons. Narrow oblong ricks rounded at the ends possess many advantages, both in the economy of labour and thatch, over those of other forms that have the same contents: besides, they admit of the thatching being performed at one end before the other is finished, or as the stacking proceeds.

But in any case the expense of thatch is of no great importance, as, when removed from the stacks, it serves very well as litter for the cart-horses and other cattle\*. And even barley- or oat-straw will answer the purpose perfectly well when drawn in an even manner and put on with sufficient care†.

In districts where the stubble is left high, it may likewise be employed as thatch for grain-stacks, as has been already seen. But when it is intended to make use of it in this way, it should be mown as close to the ground as possible immediately after the corn has been removed from the field, being then raked together by means of a large *horse stubble-rake*‡, and carried to the farm- or stack-yard in order to be put up in a sort of stack for future use.

When not applied as thatch, it may be made use of in the way of litter for the cattle-stalls and fold-yards with great advantage. The practice of collecting it from the fields should therefore be constantly attended to as much as possible, as other sorts of straw may be saved thereby, and at the same time much manure produced.

In regard to the methods of trimming grain-stacks after they have been set up and thatched, they are differently performed in different districts. In the southern parts of the kingdom, where the injudicious practice of housing grain loose fre-

\* Communications to the Board of Agriculture, Vol. I. † Ibid.

‡ Section on Implements



quently prevails, it is an useful mode to pare or cut the outsides of the stems of corn-stacks in an even neat manner, by means of a sharp hay-knife or some other sharp tool. In this way the rain is more effectually prevented from being absorbed or taken into them along the loose straws. But where the grain is cut by the sickle and bound up into sheaves this is unnecessary, if the operator take sufficient care in building the stacks. In this, as well as the preceding method, it will, however, be advantageous to have the thatch evenly cut round the eaves and other parts where it may project, as the rain will thereby be less apt to fall against the bodies of the stacks in bad weather, and at the same time give them a neater appearance.

*Threshing of Grain.*—In threshing out grain different methods are pursued. The wheat-crops, in some districts where the straw is much used for the purpose of thatching farm buildings, is lashed out over a strong wattled hurdle, stone, or other similar contrivance. In other cases, this as well as all the other crops are threshed out by means of the flail or the threshing machine.

The flail method, from its being an extremely slow, tedious, and expensive process, and at the same time one that requires a great number of labourers, can, perhaps, only be practised with advantage on the smaller kinds of arable farms, that are cheaply situated in respect to the command of workmen, and where the expense of large machines would be much too great for the quantity of grain which they produce. But even in these cases, if the small hand threshing-engines that are constructed on cheap simple principles, and which occupy but little room, should be brought to perform the business in an easy, expeditious, and effectual manner, which seems not improbable from the improvements that have been recently made in this sort of machinery, it will most probably be to the advantage of such farmers to abandon it, as the saving in various ways must soon repay them the expense of the machines, and at the same time afford them a considerable profit.

Besides, where the threshing is performed by the flail, expensive barn-floors, either of the fixed or moveable kind, will constantly be necessary. The latter sort may, indeed, sometimes be capable of being converted to other purposes. In this way too the produce is constantly exposed to the depredations of the persons that are employed in executing the business, which, in many cases, proves a source of great loss to the farmer, as he cannot by any means prevent the impositions to which it is liable. It has been well observed by the intelligent surveyor of a southern district, that where threshers are employed by the day, they frequently



do not perform half the work that ought to be done in the time, nor even that in a perfectly clean manner; and, that if it be executed by the quarter or the truss, the freest corn is threshed out and the rest left in the ear \*. The same thing takes place in a greater or less degree in every other method that can be adopted for having the threshing performed by the hand; it is consequently only by the general introduction and use of the threshing machine, that the property and interest of the farmer can be fully secured, and the work be executed with that degree of economy which the greatly increased price of labour demands.

The superiority of the method by machinery over that of the flail is very considerable in many other respects, besides those of its executing the work in a much more clean and perfect manner †, and with infinitely greater dispatch, so as to admit of the farmer being present during the process. Sufficient supplies of both corn and straw may at any time be almost immediately provided, either for the purposes of feed, the market, or the feeding of animals, without the other operations of the farm being in any degree interrupted. It is likewise obtained with much less waste of the grain, and with less danger of its being injured by being bruised.

From the increasing scarcity of labourers, the great advances in the price of labour in all the well-cultivated districts, and the impossibility of having this sort of work performed in a clean manner by the flail, the necessity as well as utility of these machines seems established. The principal obstacles to machines of this nature being more generally made use of, are chiefly those of expense in their erection, and the slovenly practice which prevails in some of the more southern districts, of securing grain crops in a loose manner. The first of these objections may probably, however, be obviated by the construction of hand threshing-engines; and the latter by the discoveries and improvements that are daily taking place in this sort of machinery. The objections that have been raised against the practice, on the score of its depriving labourers of employment during the winter season, are scarcely deserving of notice, as experience has fully shown that no injurious con-

\* Corrected Agricultural Report of Middlesex.

† It was found by the author of the Survey of Kent, on having different parcels of wheat-straw of thirty-six pounds each threshed out clean by the flail, by different farmers, and the same weight of straw threshed after it came from the machine; the average produce of corn left in the straw by the common mode of threshing was half a pint in every thirty-six pounds of straw, more than that left in the machine method.



sequences can result from it, as there must always be work enough of other kinds at such periods, where farms are under a judicious mode of cultivation\*. And the inconveniences that may attend the largeness of the quantity of straw that must be at once produced in this method, may be easily obviated either by placing it immediately in close stacks, or by having a part of it cut into chaff and laid up in a well-ventilated granary, as, in this way, there can be little doubt but that it will keep well, provided the operation has been performed while the straw is dry. Besides, by the use of one horse or hand-machines the work may proceed without this trouble, as the straw is wanted for the uses of the farmer, which, in the case of store cattle being fed with it, may be a more advantageous practice. But where the fold-yard and cattle-stalls are kept properly littered, and as frequently changed as may be necessary for promoting its conversion into manure, the farmer will seldom be much incumbered with straw.

The saving of expense in this mode of threshing, over that by the flail, must be different according to the nature of the machine and the power by which it is wrought, as well as the state and condition of the grain, and the regularity with which it is supplied. By some it is stated as about one half, while others make it much less than that proportion†. With the best constructed machines we apprehend it will be performed, on an average of different sorts of grain and different states of them, at one-third the expense of the flail method, or, perhaps, much

\* Modern Agriculture, Vol. II.

† In the different sorts of grain the expense and produce of a day's threshing are thus stated by the author of the Corrected Agricultural Survey of the County of Kent:

|                                                 | Wheat.    | £.    | s.    | d.    |
|-------------------------------------------------|-----------|-------|-------|-------|
| Eight men, at 1s. 8d. each                      | - - - - - | 0     | 13    | 4     |
| Four boys, at 1s. each                          | - - - - - | 0     | 4     | 0     |
| Four horses, at 2s. 6d. each                    | - - - - - | 0     | 10    | 0     |
| Cleaning and measuring 24 quarters, at 3d. each | - - - - - | 0     | 6     | 0     |
|                                                 |           | <hr/> | <hr/> | <hr/> |
|                                                 |           | 1     | 13    | 4     |

Which is about 1s. 4d. per quarter, or nearly half the price of the flail method.

|                                                 | Barley.   | £.    | s.    | d.    |
|-------------------------------------------------|-----------|-------|-------|-------|
| Cleaning and measuring 32 quarters, at 3d. each | - - - - - | 0     | 8     | 0     |
| Other expenses, as above                        | - - - - - | 1     | 7     | 4     |
|                                                 |           | <hr/> | <hr/> | <hr/> |
|                                                 |           | 1     | 15    | 4     |



less, without taking into the consideration any thing for the great saving in grain\*, or the other operations that may be performed at the same time, such as those of winnowing or cleaning the corn, cutting straw into chaff, bruising and grinding the grain for cattle food or other uses.

Where threshing-machines are made use of, it is advised by the writer of the Agricultural Survey of the West Riding of Yorkshire, that the barns in which they are erected should extend into the stack-yards, as by that means the machines are more conveniently supplied, and at much less expense of labour, with the grain in the straw. These threshing-engines should likewise be adapted to the size of the farms, as by proper attention in this respect much expense may frequently be saved.

In threshing corn by the flail it is the practice in some districts for only one person to be employed upon a floor; but as two can thresh together with equal if not

| Oats.                                           | £. | s. | d. |
|-------------------------------------------------|----|----|----|
| Cleaning and measuring 40 quarters, at 1d. each | 0  | 3  | 4  |
| Other expenses, as before                       | 1  | 7  | 4  |
|                                                 | 1  | 10 | 8  |

Or a little more than half the price of that by the flail; this sort of grain being commonly threshed at about 1s. 3d. per quarter.

This is without the late improvements in the machines of this kind, by which they are capable of performing the work with much fewer hands, as well as of cleaning the grain and executing several other operations, by all of which the above charges would be still much lessened.

But in the Corrected Agricultural Report of Northumberland it is remarked, that a threshing-machine is employed there that has been found, on trial, to thresh at the rate of thirty-three bushels in the hour, or two hundred and sixty-four in the day of eight hours. The expense in the attendance of the threshing and dressing parts of it being merely that of three women; one to feed in, another to hand the sheaves to the feeder, and a third to take away and riddle the corn after it is winnowed: consequently the threshing and dressing the above number of bushels only costs one shilling and sixpence, while the threshing the same quantity by the flail would be one twenty-fifth part, or ten and a half bushels, which, at two shillings the bushel, is twenty-one shillings; to which must be added two shillings for the expense of a man and two women to assist in winnowing: which makes in all twenty-three shillings.

In the north riding of Yorkshire, according to the Corrected Agricultural Survey of that district, threshing by the machine is undertaken in oats for sixpence, and wheat a shilling the quarter, the farmer finding horses.

\* In the same work it is likewise stated, that in this, some reckon a profit of at least five per cent.; others, as equal to the seed and price of threshing, which is somewhat more than half the price of the flail method; this sort of grain having of late been usually threshed at about 1s. 6d. the quarter.



greater expedition, it must be an ineconomical and disadvantageous mode. But where more than two labourers thresh together, which is sometimes the case, there must be frequent interruptions, and a consequent loss of time. The tool by which this sort of business is performed should be well adapted to the size and strength of the person who makes use of it, as when disproportionately heavy in that part which acts upon the grain, it much sooner fatigues the labourer, without any advantage being gained in the beating out of the grain. The best method of attaching the different parts of the implement together is, probably, by means of caps and thongs of good tough leather : iron is however sometimes employed. In threshing most sorts of corn, but particularly wheat, the operators should wear thin light shoes, in order to avoid bruising the grain as much as possible. In the execution of the work, when the corn is bound into sheaves, it is usual for the threshers to begin at the ear ends and proceed regularly to the others, then turning the sheaves in a quick manner, by means of the flail, to proceed in the same way with the other side, thus finishing the work.

When much threshed grain has accumulated on the threshing-floor, it is necessary to separate the short straw and chaffy matter from it, by passing the whole through a wide riddle or sieve for the purpose. This should always be done before too much grain has been collected, as in that way the bruising of the grain may be more effectually prevented. The short chaffy substance thus separated is in some districts termed *cavings*, and is capable of being employed with advantage in the feeding of horses or neat cattle. After this has been accomplished, the loose grain should be thrown up to the sides of the floor, or, what is better, into a chamber conveniently formed for its reception, where it should remain till a sufficient quantity has been collected to render the clearing of it by the winnowing machine or other contrivance necessary.

It is almost impossible to ascertain the quantity of grain that a labourer can thresh out in the course of any given period of time, as it is obvious that much must depend on the nature of the grain, the freeness with which it threshes, and the exertions of the labourer : in general it may be of wheat from one to one quarter and a half ; of barley from one and a half to two quarters ; of oats, mostly about two in the day. The exertions of labourers in this sort of work in the northern districts of the kingdom, are however much greater than in those of the south ; of course a much larger proportion of labour must be performed. In some places it is the practice to thresh by the measure of grain, as the bushel, quarter, &c. while in others it is done by the threave, of twenty-four sheaves, and in some by the day.



In Kent, before the late rise in the price of labour, it was usual to pay from two shillings and six-pence to three shillings the quarter, for the first of the above sorts of grain; two shillings the quarter for the second; and one shilling the quarter for the third\*. And in the midland and northern districts the prices are nearly the same, or perhaps a very little lower in the latter. In the above county beans are likewise threshed at one shilling the quarter, and peas from one shilling and sixpence to two shillings the quarter. But in whatever way the farmer has this sort of business executed, there is always much necessity for his constant inspection, in order to prevent the frauds and impositions that are too frequently practised.

All sorts of grain and pulse, when the straw is intended to be made use of as cattle fodder, should only be threshed out as the straw is consumed, as it is eaten much better, and is more nutritious in this fresh state than when given them after it has been laid by some time after being threshed. And the same is the case with the *caving-chaff* or other material separated from the grain†.

The grain as soon as threshed out should constantly be cleaned from the chaff and other extraneous matters, as by delay in this respect the sample is liable to be much injured. There are different methods of having this business performed; the best is probably by means of the improved *winnowing* machines, as the work is executed in this way in a very cheap perfect manner, and at the same time with much ease and dispatch.

In some districts it is however the common practice to have the grain cleaned by means of the *casting-shovel* and flat broom, which is denominated a *spry*, which serves the purpose of sweeping off the chaffy materials and the small portions of straw that are detached by the wind from the corn. Where the barn-floors are sufficiently large in all directions, this mode of clearing grain is conceived by some to be the best and most expeditious, but that where the room is confined, winnowing machines will not only do the work better but perhaps at a more cheap rate‡. The other methods of rendering grain clean by exposing it to the action of the wind, on the threshing-floor of the barn, or before the sails of a machine, though practised in some districts, are so imperfect and troublesome as to deserve no attention from the enlightened agricultor.

Where the corn is cleaned in the first of the above methods, there is in most of the improved machines of the *winnowing* kind a screen through which the grain passes after it has been cleaned from the chaffy substances, and by which

\* Synopsis of Husbandry.

† Ibid.

‡ Boys's Agricultural Survey of Kent.



the small seeds of all sorts, as well as other foreign matters, are readily separated from the corn. This process is particularly necessary with wheat and barley. And if these grains be cleaned without the *winnowing* machine, it will of course be requisite to let them through a corn-screen afterwards, in order to remove any small seeds they may contain, as well as the ova of different sorts of insects, by which the production of the weevil, moth, beetle, &c. is prevented; and the depredations which they commit, while in their vermicular state, on different sorts of grain, effectually obviated. Implements of this nature may be had separately, but the business is much more conveniently and cheaply executed at once by the winnowing machine.

*Preserving of Grain.*—After the grain has been thus rendered clean, it is in a proper condition either to be sent to the market, or for being laid up in a state of preservation. As the prevention of all sorts of corn from being affected by the different causes that have a tendency to injure it, when laid up for the purpose of keeping, depends upon its being put by in a perfectly dry condition, and on its being afterwards preserved in that situation,—in order to effect these objects in the most perfect manner, it is of the greatest importance to keep the corn, from the first period of its being threshed out of the straw, as much as possible from coming in contact with earth, stone, or other sorts of floors that are placed near to or upon the ground, as they have constantly much disposition to communicate moisture, and by that means greatly injure the grain. And another method is by preventing the entrance of the atmospheric air as much as can be done, whenever it is in a heavy damp state, by being too much loaded with humidity; as in this way, from the vast extent of surface that is exposed to its influence, it is subject to be very much damaged, the large quantity of moisture thus imparted to the corn bringing on a sort of mouldiness, which is attended with a musty disagreeable smell that lessens its value in a very considerable degree, as well as prevents its keeping.

The chief remedy in the first case, is by cautiously avoiding the too common practices of permitting the grain to remain upon the threshing-floors, especially those of the earth or stone kinds, after it has been threshed out, before being cleaned from the chaff; or, after being cleaned, by depositing it upon them either in a loose state or when put up in sacks. A perfectly dry room or bin should constantly be provided for its immediate reception, the business being performed as much as possible in a dry state of the atmosphere. And in the second, a great deal may be accomplished by means of proper slides, shutters, or other suitable contrivances being conveniently fixed in the pipes, funnels, or other openings intended for the purpose



of ventilation, in the corn-rooms or granaries, which should be kept closely shut up whenever the atmosphere is so much charged with moisture as to prove detrimental to the grain.

And as frequent turning or stirring the grain, and ventilation, are found by experience to be essentially necessary for preserving and keeping it perfectly sweet and fit for sale, it is obvious, on the above principle, that this should only be attempted when the weather is fine, or the air in a dry elastic state. In damp weather, or when frost prevails, it should be excluded as much as possible. Besides air, light is likewise advantageous in the preservation of corn, under similar circumstances, as, without its being admitted, a sort of vegetable mucor, usually denominated mould, is apt to fix upon the grain and produce much mischief, as it is said to possess the same property as that of other funguses, of growing where there is scarcely any change of air, and in situations where there is little or no light, provided there be a suitable degree of warmth and moisture\*. On the same principle, with the intention of retaining the grain in a state as free as possible from dampness, it might be useful to have well constructed stoves in the bottom parts of corn chambers or granaries, for the purpose of occasionally communicating such moderate degrees of heat to the grain as would be sufficient to dry up and expel any injurious moisture, that it might have attracted in damp wet seasons. On this ground it has indeed long ago been advised on the basis of experience, by an intelligent writer †, to preserve wheat by exposing it to the action of a sunshine degree of heat, on a hair cloth in a malt-kiln, produced by the combustion of clean straw, for such a length of time as may be necessary to remove the dampness; as from four or five to ten or twelve hours, according to the proportion in which it may exist. In this method the heat should always be kept so moderate as not to destroy the vegetative property or life of the grain; as by that means its putrefaction and decay would be promoted. The degrees of heat that would be the most calculated to answer the purpose in different cases would be easily regulated by those instruments that are in common use for measuring the heat and moisture of the atmosphere.

The principles advanced above, assist us much in reconciling the differences of opinion, that have so long prevailed in respect to the use of air in the preservation of corn in granaries; as they sufficiently show that when admitted in its perfectly dry and elastic state, it must be particularly useful in carrying off any moisture or disagreeable smell that the grain may have contracted by remaining closely heaped together for some length of time; as by the stirring which mostly accompanies the

\* Darwin's *Phytologia*.

† Mr. Tull.



ventilation it must operate in a very extensive manner; but that when applied in its moist heavy state, it must be detrimental in an equal proportion, by imparting its humidity to the corn, and by that means causing it to become musty.

The ventilation of grain should consequently be performed when the weather is fine, but never when the air is in a damp condition, or in the time of frost. This is the most completely effected by stirring the corn by proper slides or other contrivances in the floors, windows, and other openings in the granaries or corn-rooms\*; but it may be accomplished in a more slow and of course in a more uneconomical manner, by shovels, rakes, or other similar tools. But in order that this operation may be more readily as well as more perfectly executed, the grain should never be spread too thickly over the floors of such granaries or store-rooms. From one to two feet or two feet and a half in depth, in proportion as it gets more dry and free from moisture, is fully sufficient for the purpose; as from the natural moisture of the corn when heaped together to too great a thickness at first, it is sometimes apt to take on too much heat, by which the quality or sample is greatly injured. Soon after its being deposited, frequent screening should also be practised, and afterwards occasionally according to circumstances. There are likewise other circumstances to be attended to, by which the due ventilation and preservation of the corn is much influenced, such as those of having the doors, windows, and other principal apertures of the buildings placed towards the south, and as close to the ceiling as may be, so that the rays of the sun may enter as freely as possible. Besides, the linings of such corn-rooms should always consist of materials that have not a tendency from their coldness to precipitate the moisture from the atmosphere, which is often the case when warm damp south-west winds take place after cold north-east ones, and in that way impart it to the corn that comes in contact with them†. In every case the prevention of the entrance of wet or moisture should be effected by sheltering boards, slides, or other similar contrivances.

Some management in the turning or stirring of the grain is also requisite, in order that ventilation may take place in the fullest and most complete manner. When the grain is first deposited and possesses much natural moisture, it should be much more frequently turned over, than afterwards when it has acquired a greater degree of dryness. Once or twice in every week or ten days may be requisite the first month; afterwards, for four or five months longer, about once in the fortnight may in general be sufficient, and after that period only once in the month, except when the season proves very moist and warm‡.

\* Section on Implements. † Phytologia. ‡ Communications to the Board of Agriculture, Vol. I.



In some places empty spaces are left on the sides of the heaps of corn and other parts, into which they may be turned over when necessary. But in others, square holes are formed in the ends of the floors, and round ones in the middle, by which contrivances the grain is thrown from the upper to the lower chambers, and back again, by which it becomes more perfectly agitated and exposed to the air. This method is practised in some parts of Kent.

As such frequent turnings in these methods are extremely troublesome and expensive in being executed by the shovel, sliding shutters have been contrived in the middle of the different floors which have an inclination towards the centre of the granaries, by the occasional removal of which, and the opening of the windows and ventilators, the grain is turned and ventilated at the same time with great facility and convenience. Monsieur du Hamel has found this mode of preserving grain to answer extremely well, even in cases where it was laid up in a moist state.

But grain may be preserved without having recourse to the process of ventilation, by having it deposited, when in a perfectly dry state, in such dry deep wells, pits, or other situations below the surface of the ground, as that it cannot be affected by heat, or the changes that take place in the season. But though corn has been known to have been preserved in this method for a great length of time in countries where it is the practice to store it up for times of scarcity, it is not by any means so safe or so convenient a mode as the former.

In whichever method corn is secured, care should be taken that such as is moist, or has been badly harvested, be not laid up with that which is dry and in a perfectly sound condition; as from the quantity of moisture that it contains, and the state of germination that takes place in consequence, a musty bad smell is apt to be imparted to the whole, and the sample be wholly spoiled\*.

But besides the danger to which grain is exposed when laid up, from the want of dryness and ventilation, it is liable to be destroyed by the depredations of animals of different kinds, in the states before they assume that of the insect†. As these are produced from ova deposited among the grain by the animals when in their more perfect or insect growth; it is obvious that the best means of guarding against their ravages is that of preventing their generation by the destruction of the ova before they assume the vermicular state. This is best effected by frequent screening and exposure to a current of fresh air; as by these means the nests which contain and protect them are broken and destroyed, and the animals after passing through the screen in the different operations are wholly removed with the other extraneous matters.

\* *Modern Agriculture*, Vol. II.

† The Moth Weevil and Beetle.



The exposure of grain to the free action of the atmospheric air has been condemned by some from the circumstance of the ova of insects being liable in that way to be deposited among the corn; but it is more probable, when the economy of such insects is considered, that their ova are either deposited originally among the grain in such situations, or brought in with different parcels of corn from other places. On this last account great caution should be used in bringing fresh parcels of grain to be laid up, and the use of the screen be constantly had recourse to before it is attempted.

Where corn is to be preserved for a considerable length of time, though it may unquestionably be kept with safety by proper care and attention in granaries or corn-chambers, it is probably a much better, as well as more certain and economical practice to suffer it to remain unthreshed from the ear, in the stack, especially when built on proper staddles in the manner that has been described above.

In cases where the corn is ground, and afterwards preserved in the state of meal, it is the best practice to pack it as closely as possible, by treading into perfectly dry small close rooms, as when laid up in proper condition in this way it will keep perfectly safe for several years.

When it is necessary to preserve grain for any length of time after it has been threshed out, it is obvious that proper granaries should be provided; the size of which should constantly have a relation to the extent of the farm, being always sufficient to contain one half of the corn that is produced when it is threshed out. In their erection the proprietor should probably, in all cases, except where there are very long leases, be at the whole of the expense.

But though the practice of preserving grain in stacks or granaries, from the convenience and advantages that may in some cases arise from it, both to the farmer and the public, may be in some degree necessary, it is evident from the result of experiments carefully made\*, that the storing of corn in either way should be carried to as little extent as possible, as there is found to be a constant decrease in its weight, from the period at which it has been harvested or laid up, but that at first this loss is considerably greater than when the corn has been kept for some time†. On

\* Holt in Hunter's *Georgical Essays*, Vol. II.

† In these experiments,

| <i>Wheat,</i>                                                       |       | <i>lb. oz. drs.</i> |
|---------------------------------------------------------------------|-------|---------------------|
| On being rubbed out in the hot sun, and weighed the 31st of August, |       |                     |
| 1789, soon after being cut, afforded                                | " " " | 0 2 11              |
| On being weighed again on the 18th of October                       | " " " | 0 2 7               |
| Loss of weight per bushel of 70lbs. nearly                          | " " " | 6 8 3               |

Or almost one tenth of the whole in forty days. Of this wheat thirty-two grains weighed one penny weight.



these grounds it is therefore sufficiently obvious, that the sooner the produce is brought to the market, the greater must be the advantage to the proprietor, provided other circumstances be the same.

Having thus explained the culture necessary in tillage lands, and the modes of cutting, managing, and preserving the different sorts of produce, we shall proceed to the means of restoring them to grass.

*Lands proper for Tillage and Grass.*

It is obvious from what has been already advanced, that some sorts of land are much better calculated for the production of grain crops than those of the grass kind; while, on the contrary, there are others that are much more suitable and better adapted to the raising of grass than corn crops. There are still others that may be cultivated under a convertible system of corn and grass, with more success than in either of the other methods alone.

Of the first description are all those lands which possess a sufficient degree of dryness, whether they have much staple or depth of mould or not, and which in their natural state have but little tendency to produce good herbage, such as those covered with different sorts of coarse plants and vegetable productions, whether in an open or inclosed state. It has been well observed by a late writer, that grounds of this nature are of considerably more value when in a state of tillage than in pasture;

It is however observed that this is the greatest possible loss that grain can sustain, as though it was fully ripened it had neither had the advantage of being dried by exposure to the sun after being cut, or undergone the process of fermentation after being put together.

|                                                                                    | <i>lb. oz. drs.</i> |
|------------------------------------------------------------------------------------|---------------------|
| Another quantity weighed on the 22d of October, produced                           | 0 6 3               |
| Weighed again twenty-four days afterwards, afforded                                | 0 6 0               |
| Loss in that time per bushel, at the rate of                                       | 2 1 15              |
| A further quantity weighed on the 8th of January, 1790, produced                   | 0 2 2               |
| Lost per bushel, on being weighed again thirty-two days afterwards, at the rate of | 2 0 15              |

*Barley,*

|                                                                          |        |
|--------------------------------------------------------------------------|--------|
| On being weighed September the 2d, under similar circumstances, produced | 0 2 2  |
| On being again weighed October the 18th, afforded                        | 0 1 12 |
| Loss of weight per bushel of 60lbs.                                      | 8 4 22 |

Or about one seventh of the whole in forty-seven days. Twenty-four grains of this barley weighed one penny-weight two grains.



as they are particularly adapted to the improved modes of husbandry, and in addition to the quantity of grain to be produced from them, will afford a greater quantity of vegetable food for animal stock when in a tillage state, than they did when kept entirely in pasture\*.

There are various descriptions of light lands that may likewise be kept in a state of tillage with more advantage than in that of grass, as they are peculiarly suited to those improved modes of cultivation that are necessary for raising large supplies of green food for the support of live stock of different kinds. The poorer sorts of sand lands, where marl, clay, chalk, or other similar substances can be readily procured, are much more proper for the purposes of tillage than those of grass, as is sufficiently shown by the improvements that have been made in many of the more southern districts of the kingdom†. Lands of the chalky kinds, whether of the more superficial or deep descriptions, are in most cases better suited for tillage than grass, as from their wetness in the winter season, and their openness and friability in the summer, it is almost impossible to establish good herbage‡.

And there is still another sort of land that is better for the purposes of tillage than those of grass, which is that which in the state of grass is constantly so disposed to the production of moss, as to afford but a very scanty share of good herbage.

Most of the clayey and more heavy descriptions of land, especially when situated in valleys, or other low confined exposures, though they may be capable of affording good crops of particular kinds when under the plough, as those of the wheat and bean kind, are, on account of their retention of moisture, the increased expenses of labour, and the uncertainty of season for tilling them, as well as their inaptitude for most other sorts of crops, and their fitness for the production of good herbage, much more beneficial in the state of grass than in that of tillage. Where there is an opportunity of procuring sea sand, and of applying it at an easy expense, they may however be converted to the purposes of tillage in a profitable manner. Most of those strong cold grass lands which in a state of tillage would be improper for the growth of turnips, and other applications of improved cultivation, should also constantly remain in the state of grass. And likewise those lands that are situated near large towns, where manure is plentiful, and of course capable of being procured at a reasonable rate; and where the produce of such lands is always in great demand, and therefore capable of being disposed of to great advantage. Such lands as are situated on the banks of large rivers or brooks, which are capable of being improved by means of watering, are likewise more beneficial when kept constantly under the grass system than any other mode of cultivation that can be practised. The lands

\* Davis in *Communications to the Board of Agriculture*, Vol. III.

† Ibid.

‡ Ibid.



of a calcareous nature which are distributed in the valleys of the more mountainous districts, where old grass land is scarce and of much importance, and most part of that in the state of tillage incapable of being converted to the condition of good grass, may also be the most advantageous when continued in a permanent state of herbage. The sorts of land that are the most adapted to the practice of convertible husbandry are those of the loamy kinds, which are not too strong for the growth of turnips. These in all their different varieties are capable of being changed from the state of tillage to that of grass, and the contrary, not only without sustaining any injury, but frequently with the most evident advantage, as the practice of some of the western and midland districts has fully proved\*.

The richer kinds of sandy lands are in most cases also well suited to this sort of husbandry; especially where marl is at hand, to be applied at the time of laying them down to the state of grass.

And grounds of the peaty sort may in many cases be the most beneficially employed in this mode of culture, as, from their producing little else than plants of the aquatic kind, it is obvious that they must be completely destroyed, and those of the proper grass kind be introduced, before any useful herbage can be produced. And this is capable of being accomplished in by much the most perfect manner under the state of tillage. But as they are in most instances much too tender and moist for the purpose of remaining long in the state of tillage, as soon as the above intention has been fully effected, they should be restored to the state of permanent grass†.

*Laying Lands down to Grass.*—It is evident therefore that some sorts of soil are much more difficult to be brought into the state of grass than others, and that, when this object has been attained, some are much more profitable and advantageous than others, as affording a much better and more permanent herbage. In some districts the business of restoring the land to the state of sward, after it has been in that of tillage, is effected with the greatest ease and facility: the ground, on being left in an unploughed condition, from its natural tendency to the production of herbage, returns to the state of sward, almost without trouble, feed, or expense; while in others all the art of the most careful agricultor is found insufficient for accomplishing the purpose. It has been remarked that “after twenty years fruitless expectation and expense, the landholders have frequently been obliged to restore the land again to a state of tillage‡.”

\* Communications to the Board of Agriculture, Vol. III.

† Ibid.

‡ Davis in Communications to the Board of Agriculture, Vol. III.



But besides this disposition in soils for taking on the growth and establishment of grass crops, there are other circumstances to be considered in restoring them to the state of sward after they have been under the plough; such as those of their possessing neither too much or too little moisture, and that of their having a sufficient staple or depth of mould for the full and secure establishment of the grass plants. As where the soils are too wet, or too retentive of moisture, they will sustain much injury if not be wholly destroyed during the winter season, when there is much rain and frost, as well as be quickly superseded by plants of the coarse aquatic kind, such as the rush, &c. And where they are too dry, the grasses will be liable to be destroyed by heat during the summer months, by the little moisture which they contain being thus carried away, and of course leave their places to be supplied by other sorts of coarse plants, such as those of the moss, fern, and heath kinds, according to the nature of the ground. A good depth of mould or soil is likewise requisite, in order that the roots of the grass plants may penetrate or run down to such a depth below the surface, as to be in a great measure out of danger from the effects of heat and evaporation in the summer season. On this as well as other accounts it is therefore better that the lands intended for grass, especially where they are to be kept in a permanent state of sward, should incline in some measure to a state of moisture, or be in such a degree retentive of it, as to preserve that state of humidity which is necessary for the healthy and vigorous growth of the plants, without endangering the destruction of their roots by putrefaction, from its stagnating in too large a proportion about them. It is chiefly on this principle that the more light, thin, dry descriptions of soil are better suited for the production of grain, or the occasional practice of convertible husbandry, than for that of permanent grass.

There are still other circumstances connected with the nature of the soils, which are necessary to be particularly attended to in the laying of lands down to the state of grass, as those of properly adapting the grass plants to their qualities, some sorts of grasses being much more impatient of wet than others, consequently more proper for the drier sorts of land; some more capable of resisting the effects of heat and drought, and of course more suitable for the thinner and more porous kinds of soil; while others delight in a moist or wet soil, and are incapable of being grown with any success on such as are of a dry quality. They likewise differ much in respect to their hardiness: some resisting the effects of cold much more effectually than others, of course are more adapted to high exposed situations. Besides these, they vary in other respects, some succeeding to the most advantage in soils of the clayey kind, others in those of a loamy quality, while others delight in those of a sandy nature;



a few in those of the calcareous kind, and some in those which partake much of the nature of peat.

And in addition to these different natural propensities, there are some grasses that have the property of rising to a great height in the stem, and of course of affording a large coarse produce, while others are more limited in this respect, but spread and extend themselves more in a lateral direction, affording a less proportion of produce, but which is of a finer quality. The former, with certain restrictions, would seem better adapted to the purpose of hay, though the latter may be applied to the same use, where the fineness of quality is preferred to quantity of produce. There are likewise some sorts of grasses that contain much larger proportions of saccharine matter in their compositions than others, as well as more leaves and fewer flower-stems; and which, from the avidity with which they are fed upon by different sorts of live stock, and the success that attends their being thus consumed in the improvement of such stock, would appear to possess the largest proportion of nourishment; and of course to be the most proper for being introduced where the lands are intended for the purpose of grazing, or fattening animals by means of vegetable food in its grassy state.

There is another property of grasses in which they differ considerably; and which it is of much consequence to have regard to in the laying lands to the state of sward. This is that of early growth, which is a circumstance of vast importance in a grazing point of view, as there is in general a great deficiency of grass for the support of stock in the early part of the spring.

It is indeed the opinion of a late intelligent writer\*, that in the forming of good meadows, or other grass-lands, there should be a combination of these different circumstances, as it is chiefly by the first, or the quantity of produce, that the cultivator is enabled to support his live stock, and pay his rent; of course no expense in labour or manure is spared to obtain it by the prudent farmer. It does not however follow, he says, that this should be solely regarded, or that to attain it the coarsest sorts of plants should be cultivated; nor will the grasses that are recommended merely for their being relished by cattle, or for the sweetness of their foliage, if they are found to be deficient in the quantity of produce, fully answer the views of the farmer or grazier, as, to constitute a good meadow or pasture, an abundant produce is necessary. Though animals prefer some sorts of food to others, it is not possible to indulge the live stock that is to be supported constantly with the

\* Mr. Curtis.



finest and most delicate hay, or herbage. Besides, it is not improbable but that the productive grasses may in some cases be highly nutritious, or that cattle may eat as eagerly the herbage, or hay, made from the coarse as the fine grasses. And cattle are frequently known to thrive on food to which they are habituated by necessity, though at first they could scarcely be prevailed on to eat it.

In making experiments, persons are apt, he conceives, to conclude too hastily from the appearance which a plant assumes on its being first planted or sown; as the most insignificant vegetable will often make a great show, when its fibres have fresh earth to shoot into: but the trial comes when the object of the experiment has been in a meadow or pasture several years, when its fibres, from long growth, are matted together, and it meets with powerful neighbours, to dispute every inch of ground with it: if it then continue to be productive, it must have merit. It is well known, he says, that lucern, when left to itself, is soon overpowered; and if broad-leaved clover, which is undoubtedly a perennial, the first year be sown, a great crop is produced; but let the field be left to itself, and the clover, like the lucern, will yearly diminish,—not because it is a biennial, as has been often supposed, but because plants hardier, or more congenial to the soil, usurp its place: this shows therefore that at the same time that a good plant is introduced, it should be a powerful one, and such as is able to keep possession, and continue to be productive.

In respect to the property of cattle's thriving on the food they eat, it is unquestionably of great consequence; and it is to be regretted that our knowledge of the most nutrient kinds of herbage is so confined; but of those plants which have been in cultivation we are enabled to speak with some certainty: it is well known that clover, lucern, saintfoin, tares, and several other plants, have a great tendency to fatten cattle; but what natural grasses, or other plants, which have not been subjected to separate culture, have this particular tendency, and in what degrees, remains to be ascertained by the test of experiment. But as leguminous plants are in general found to agree with cattle, it may be reasonably concluded, he thinks, that a certain quantity of them may be proper and advantageous in pastures.

It is well known that certain pastures are more disposed to fatten animals than others; but how far this depends on situation, and their particular produce, remains to be ascertained.

With respect to the property of early growth, the want of early herbage in the spring is the general complaint of farmers and graziers in all the best grass districts of the kingdom: those plants, therefore, which are found to shoot at an



early period, and to put forth early foliage, especially when it is such as is grateful to cattle, must be deserving of great attention. As far as grasses have to do in this business, the few mentioned hereafter may, he supposes, effect all that can be expected in this way: much must, however, depend on seasons: if the winter should be severe, or north-easterly winds prevail in the spring months, grassy herbage will be backward, in spite of all that can be done; but in order to counteract the bad effects of such seasons as much as possible, pastures and grass-lands should, in his opinion, be warmly situated, and not drenched too much with moisture, being sheltered by thick hedges, and divided into small enclosures. But where early pasturage is the great object of the cultivator, there are other plants that may deserve a place among them, such as those mentioned below.

And though early herbage is highly valuable for pasturage, it is not less so for the purposes of hay; as by the middle of May at the latest, a meadow of this sort would be fit for cutting; and the second hay-making might begin by the time that hay-making usually takes place in other cases; and by this means the double advantage be obtained, of a larger produce, and less risk in securing it.

On the principles that have been already explained, there can be little doubt but that by a judicious and due attention to the different circumstances and uses for which grass-lands are intended, as well as to the selecting and mixing of the best and most proper grass-seeds, and adapting them to the particular nature and circumstances of the soils, after they have been brought into a suitable condition for receiving them, those grounds which have been in a state of tillage may be laid down to the state of sward, in a much better and more beneficial manner than has been the case under the indiscriminate use of such as were in, or which have sown themselves on the lands from the contiguous pastures.

It has indeed been long since remarked as extraordinary, that cultivators should have neglected to make a proper advantage of plants of such importance, and which, in most situations, constitute the principal food of live stock, from the want of properly distinguishing and selecting such as are the most advantageous and useful under different circumstances of the land\*. Some have likewise contended that the best grass-seeds cannot be collected at too high a rate, as it is possible by such means to render lands, which are suited for the production of grass, much more valuable than can be done by the common modes of laying them down†.

\* Stillingfleet's Miscellaneous Tracts.

† Kent's Hints, and Anderson's Essays, Vol. II.



Much difficulty has without doubt been thrown in the way of introducing the most proper sorts of grasses, in laying lands down to sward, from their near resemblances to each other, in many instances, requiring the nicest discernment to distinguish them, and from the want of other means of procuring them.

It has been lately observed by an intelligent botanical writer, that if grass-lands, such as downs, pastures, and meadows, be carefully examined, they will all, except such as have been recently laid down with rye grass or clover, be found much in a state of nature, replete with an indiscriminate mixture of plants, some of which produce cattle-food of a good kind; others, such as is of a very indifferent description; some affording good crops, while others scarcely yield any at all\*. It is therefore

\* Curtis's Practical Observations on British Grasses.

This accurate botanist, on procuring small turfs, taken indiscriminately from different downs and commons in Hampshire and Sussex, employed as sheep-pastures, found, on their being planted in his garden, that they produced the following sorts of plants:

*Turf from Selborn Common.*

Produced *Plantago lanceolata*. *Agrostis capillaris*. *Avena flavescens*. *Dactylis glomerata*. *Festuca duriuscula*. *Poa annua*. *Cynosurus cristatus*. *Trifolium repens*. *Crepis tectorum*. *Achillea Millefolium*. *Galium verum*. *Hypochaeris radicata*. *Hieracium Pilosella*. *Thymus Serpyllum*.

*Turf from Oakbanger.*

*Trifolium repens*. *Holcus lanatus*. *Poa annua*. *Agrostis capillaris*. *Agrostis palustris*.

*Turf from Deortum.*

*Ranunculus repens*. *Lolium perenne*. *Holcus lanatus*. *Prunella vulgaris*. *Festuca duriuscula*. *Agrostis palustris*. *Trifolium repens*. *Crepis tectorum*. *Achillea Millefolium*.

*Turf from Glynd Hill.*

*Medicago lupulina*. *Achillea Millefolium*. *Poa pratensis*.

*Turf from the same.*

*Avena flavescens*. *Festuca duriuscula*. *Festuca ovina*. *Hieracium Pilosella*. *Agrostis capillaris*. *Trifolium repens*. *Thymus Serpyllum*.

*Turf from Short Heath.*

*Festuca bromoides*. *Aira præcox*. *Juncus campestris*. *Poa annua*. *Agrostis capillaris*.

*Turf from Mount Cabron.*

*Rumex Acetosa*. *Daucus Carota*. *Medicago lupulina*. *Poterium Sanguisorba*. *Festuca duriuscula*. *Avena flavescens*.

*Turf from Ringmer Down.*

*Linum catharticum*. *Scabiosa columbaria*. *Ornithopus perpusillus*. *Avena flavescens*. *Festuca duriuscula*. *Trifolium repens*. *Hypochaeris radicata*. *Crepis tectorum*. *Lotus corniculatus*. *Juncus campestris*. *Hieracium Pilosella*. *Festuca ovina*. *Thymus Serpyllum*. *Poa pratensis*.



sufficiently obvious, that by a careful attention to the procuring of the best and most suitable sorts of grass-seeds, and applying them according to the principles which have been given above, much superiority may be attained in the forming of pasture or other sorts of grass-lands.

*Preparation of Land for Grass Seeds.*—This is a part of management that is of vast importance to the success of forming good grass-lands, but which has been much neglected in the practice of laying them down. From the smallness of the seeds, and the fibrous nature of the roots of the grass-plants in most cases, it is evident that lands which are intended for being laid down to the state of sward, whatever their quality may be in respect to soil, should constantly be brought into as fine a state of pulverization and mellowness as possible before the seeds are put in. As where the contrary is the case, from the lumpiness of the surface mould, the seeds can neither be sown with so much regularity, vegetate in so equal a manner, or extend their roots, and establish themselves at first so perfectly in the land, they are of course more liable to be destroyed by hot seasons coming on afterwards. It is probable that in this way much new laid down grass-land is greatly injured the first summer, especially when it turns out to be hot and dry. The necessary fineness of mould may be obtained in different modes, according to the nature of the lands. In the more stiff and heavy ones, by ploughing before winter, and

In six small turfs, taken from different parts of the uncommonly productive meadow near Salisbury, mentioned by Stillingfleet, and particularly described in the first volume of the Memoirs of the Bath Agricultural Society, the produce was

*In Turf 1.*

*Poa trivialis.* *Ranunculus acris.* *Triticum repens.* *Agrostis palustris.*

*In Turf 2.*

*Poa trivialis.* *Alopecurus pratensis.* *Triticum repens.*

*In Turf 3.*

*Poa trivialis.* *Agrostis palustris.*

*In Turf 4.*

*Poa trivialis.* *Triticum repens.* *Peucedanum Silaus.*

*In Turf 5.*

*Poa trivialis.* *Alopecurus pratensis.* *Agrostis palustris.* *Avena elatior.* *Triticum repens.*

From this trial it is proved, the writer supposes, that the great productiveness of this meadow did not depend on any new grass peculiar to it, but on the concurrence of different and unusual circumstances, favouring, in an uncommon degree, the growth of certain well-known grasses, as the *Poa trivialis* and *Agrostis palustris*.



leaving them to be exposed to the action of frosts and other causes during that season; having recourse to severe harrowing and occasional rolling in the early spring months; and by the frequent interposition of such sorts of crops, in the courses that precede those of grass, as have a tendency, from the peculiar nature of their roots, to loosen and render the soils fine; such as those of the bean, cabbage, rape and clover kinds. The lighter sorts of land may be brought into a proper condition for the reception of grass-seeds, by repeated ploughing and harrowing, or scuffling, and the frequent introduction in the previous crops of such sorts of green fallow crops, as have a power, by the great degree of shade and stagnation which they afford, as well as by the culture which they require while growing, of bringing the soil into a fine friable state. These are turnips, potatoes, tares, saint-foin, and others of a similar description. It has been observed by an intelligent cultivator, that where the grass-seeds are to be put into the ground with grain crops in the spring, the tillage should be performed with more than ordinary attention; which, in the case of turnips, will depend greatly upon their being consumed at such an early period as will admit of the ground being thoroughly broken down and reduced; for if there be much delay, and the season prove unfavourable, a bed of mould, sufficiently loose and mellow, will not be procured for the reception of the seeds: and when grown with spring corn, the lands should be ploughed over three times: and where the first of these earths can be given early enough to be influenced by the vernal frosts, it will be found to be much more beneficial\*. The use of the harrow and the roller will be occasionally necessary after the different ploughings, according to the nature and state of the land. But where the sowing is executed in August the same degree of attention is not believed by some to be so necessary, as the time and season afford so full an opportunity of bringing the ground into suitable order, that the most inattentive cultivator can scarcely experience any other difficulty than what originates from an unusual wetness of season†.

But besides this fineness of preparation in the soils, it is necessary that the method of cropping and application of manure in the preceding courses be such as to leave them in a state of high fertility and richness; as no good grass-land can be supposed to be produced where the lands have been worn out and exhausted by the previous crops,—a practice which has, however, been too general in the returning of arable lands to the condition of grass. Mr. Marshall has indeed very justly observed, that the want of proper condition in the lands at the time of their being

\* Close in Communications to the Board of Agriculture, Vol. III.

† Rev. A. Young in *Ibid.*



laid down to sward, added to those of improper sorts of grasses and bad seeds, is the chief cause of their not succeeding. According to some, manure ought to be applied with every other crop, and always with that which immediately precedes the grass. This is a practice that should be adopted as much as possible.

In order to have grass-lands of the best kind, it is likewise of great utility to have them so managed in the preparation, as to be rendered perfectly clear and free from all sorts of weeds, as by their rising with greater rapidity than the sown grass-plants, they are often liable to shade and destroy them, or greatly injure their growth.

It has been advised by an experienced cultivator, in restoring old worn-out lands to the state of good pasture, to clear the land from injurious weeds by means of a full winter and summer fallowing, or instead of the latter, by a crop of potatoes well manured for, and kept in a perfectly clean state by attentive culture while growing, succeeded by winter vetches fed off in the early spring\*. In all the more light sorts of soil, it is unquestionably the most beneficial practice to bring the ground into that sort of fine tilth, which is proper for the reception of grass-seeds, by a judicious mixture of green crops of different sorts with those of the corn kind, according to the nature of the soil. The most appropriate methods of intermixing these with each other have been already explained†.

When the lands have been by these methods brought into a good state of fertility, and reduced into a sufficiently mellow and friable condition of mould, the surface should be made as fine, loose, and even as possible. Where the grounds are much inclined to moisture, the ridges may be preserved, which should be of considerable breadths with very slight furrows; but in the more light and porous descriptions of land, the whole should be laid as even as possible without any ridges or furrows. In the former cases, in some districts they prefer making the ridges six, eight, or more yards in breadth, which when the land is to be under the scythe is in a much better state for being mown, and if for pasture there will be less danger of the animals being injured by being cast in the furrows. And in the latter the surface will not only be more agreeable in its appearance, but be more advantageous for all the purposes of grass management afterwards‡.

*Proper kinds of Natural Grasses.*—The circumstances that have been already observed, render it sufficiently evident that the proper choice and application of grasses must be a matter of great consequence in the laying down lands to the state of sward.

\* Billingsley's Corrected Report of Somersetshire.

† Rotation of Crops in Section on Cultivation of Arable Land.

‡ Corrected Agricultural Report of Lancashire.



But it is obviously a business attended with uncommon difficulty, from the number of trials that have been yet made, being very inadequate for affording the means of fully deciding upon their properties, advantages, and uses, in many cases, as well as from their habits, and the soils to which they are the best suited, being often very imperfectly known; and also from the great trouble and inconvenience of obtaining their seeds genuine, and in a proper state for the purposes of healthy vegetation. The grass plants of the natural kind which have been found by experienced cultivators most useful and beneficial in the different views that have been before suggested are: the Sweet-scented Vernal Grass; Meadow Fox-tail Grass; Smooth-stalked Meadow Grass; Rough-stalked Meadow Grass; Meadow Fescue Grass; Sheep Fescue Grass; Hard Fescue Grass; Tall Fescue Grass; Crested Dog's-tail Grass; Ray or Rye Grass; Yorkshire White; Cock's-foot Grass; Tall Oat Grass; Timothy Grass; Yarrow; Burnet; White Clover; Trefoil; Cow Grass; Rib Grass; and a few others which will be described below.

Most of these different sorts of grasses will be found useful in laying lands under different circumstances of soil, situation, and moisture, or dryness, to the state of sward.

*Sweet-scented Vernal Grass*\*.—This is a sort of grass that comes early into blossom: it is of course valuable as an early grass, and it is also valuable for its readiness to grow in most kinds of soil and situation, being found in bogs, in woods of low growth, or which have had the underwood removed, in rich meadows, and in dry pastures; but in point of crop it is not so productive as some, yet more so than others: cattle are said to be fond of it, and it is well known to be the only grass of this climate which is odoriferous; the agreeable scent of new-made hay being produced almost entirely by it; and the green leaves, when bruised, readily impart this odour to the fingers, by which means the foliage may constantly be known; and it may be readily distinguished when in blossom, by its having only two threads or stamina to each flower. But it is less productive in point of seed than many of the other grasses. In certain situations, especially in dry seasons, its leaves are apt to be blighted, from a disease which changes them to an orange hue, and which has proved highly injurious to the plants when in a cultivated state †.

From constantly flowering in hard stocked pasture-lands, some suppose that it is not much relished by cattle in common. In a slight proportion, as that of one-eighth, it may however answer well ‡. It thrives well on poor sandy soils.

\* *Antoxanthum odoratum*.

† Curtis's Practical Observations.

‡ Sole in Bath Papers, Vol. IX.



SWEET SCENTED VERNAL GRASS

*Anthoxanthum odoratum* L.

Fig. 1  
1844





It is, however, difficult to procure with uncommon difficulty, from the number of seeds which are necessary, being very inadequate for affording the necessary quantity for the various uses, in many cases, as well as from the nature of the soil to which they are the best suited, being often very imperfectly adapted to the soil, the great trouble and inconvenience in obtaining their proper state for the purposes of healthy vegetation. The following are the several kinds which have been found by experienced cultivation to be most useful and beneficial in the different views that have been before suggested:—the Sweet-scented Vernal Grass; Meadow Fox-tail Grass; Smooth-top Grass; Rough-stalked Meadow Grass; Meadow Fescue Grass; Hard Fescue Grass; Tall Fescue Grass; Crested Dog's-tail Grass; Blue or Blue Grass; Yorkshire White; Cock's-foot Grass; Tall Oat Grass; Flax Grass; Yarrow; Burnet; White Clover; Trefoil; Cow Grass; Rib Grass; and others which will be described below.

Kind of these different sorts of grasses will be found useful in tending lands under different circumstances of soil, situation, and moisture, or dryness, or the state of the land.

*Sweet-scented Vernal Grass*.\*—This is a sort of grass that comes early into blossom; it is of a soft texture, and is an early grass, and is also valuable for its readiness to grow in moist, low, or high situations, being found in bogs, in woods of low growth, or where the underwood removed, in rich meadows, and in dry pastures; but in point of crop it is not so productive as some, yet more so than others: cattle are said to be fond of it, and it is well known to be the only grass of this climate which is so agreeable, the agreeable scent of new-made hay being produced almost entirely by the leaves, when bruised, readily impart this odour to the fingers, by which means the disease may constantly be known; and it may be easily distinguished from the others, by the leaves being two threads or flutes to each blade. Sweet-scented Vernal Grass is more tender than many of the other grasses. In the autumn, when the leaves are apt to be blighted, from the cold, it loses its green hue, and which has proved highly injurious to the health of the animal in a diseased state †.

In the management of the land stocked pasture-lands, some suppose that it is best to be sown in a slight proportion, as that of one-eighth, it may be sown in a greater quantity. It sows well on poor sandy soils.

\* *Observations on the Grasses of the British Isles*. † *Sole in Bath Papers*, Vol. IX.



SWEET SCENTED VERNAL GRASS.  
(*Anthoxanthum odoratum*.)

PL.V  
Vol. 2 p. 824





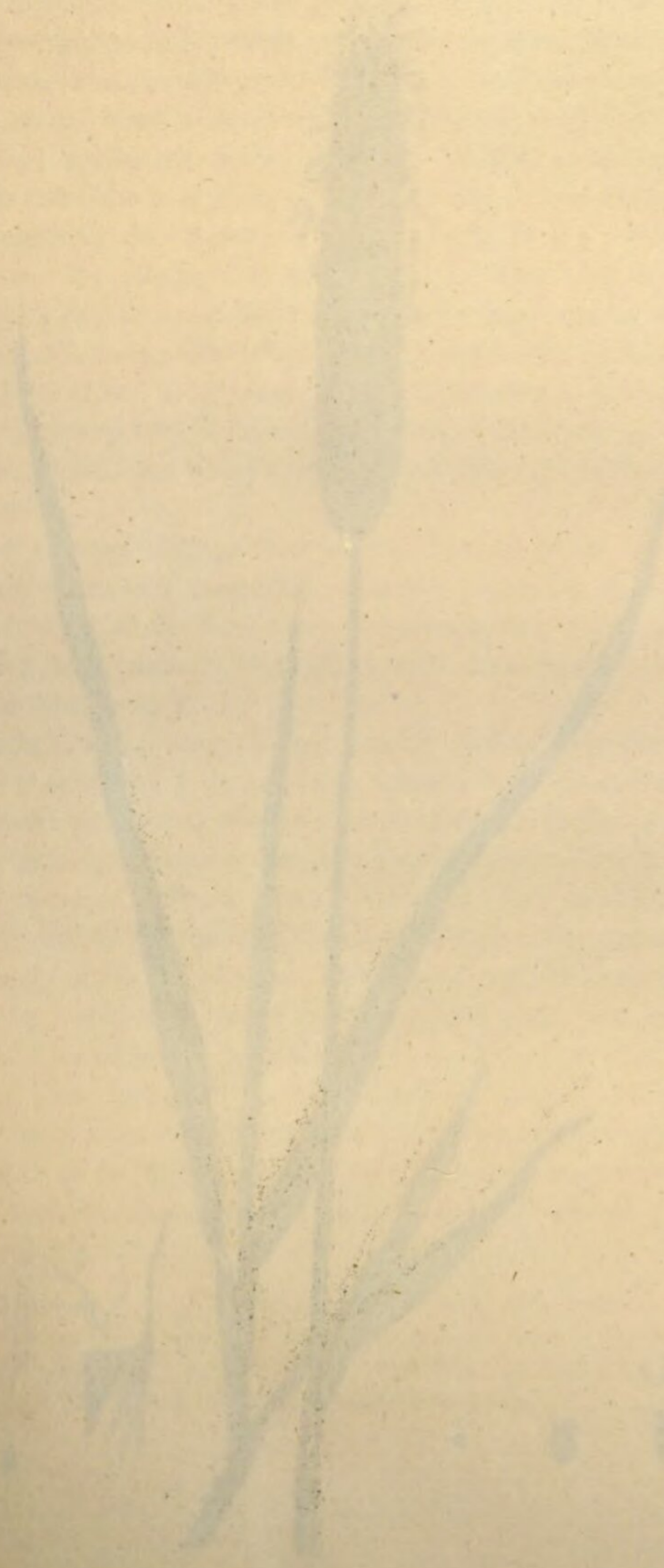
THE JOURNAL OF THE

AMERICAN GEOGRAPHICAL SOCIETY





THE UNIVERSITY OF CHICAGO  
LIBRARY





MEADOW FOXTAIL GRASS.  
(*Alopecurus pratensis.* )

PL. VI  
Vol. 2. p. 825





*Mexican Fox-tail Grass* \*—Is a kind of grass that grows well in the open fields, in some and in some situations, soil is very, as the several kinds of grasses, which it is equally valuable as an early sown, and it is a much larger and more rapid growth, it is of course much more productive than the other kinds of grasses, producing a very plentiful sward, and it is not thought too much for it as being, of all the grasses of the country, the most adapted for such a purpose, and it is a much more productive crop in such cases. Its foliage is much softer than that of the other kinds of grasses, and it is known that no grass can be produced that is so soft and tender as this. It is mown early, just as it comes into bloom, though the seed is not yet ripe, but it is not, however, be coarse. In general, the grass is much more productive than the earliness of these two grasses, and it is much more productive than the other kinds of grasses, begins at a late period, and when it is mown, it is much more productive than the other kinds of grasses, by the cultivator.

It is in some measure distinguished by the property of its being able to produce a soft spike on a long stem, which is much more productive than the other kinds of grasses, as the seed is much more productive than the other kinds of grasses, in a situation where it was perfectly established, and it is much more productive than the other kinds of grasses, to produce but few seed-stems.

In respect to the places of its growth, it is much more productive than the other kinds of grasses, growing naturally in a moist soil, and it is much more productive than the other kinds of grasses, for improving such wet grounds as are much more productive than the other kinds of grasses, for forming or meliorating meadows, and it is much more productive than the other kinds of grasses, for burnt up in dry summer seasons. It is much more productive than the other kinds of grasses, a better grass for moist loams and clays, and it is much more productive than the other kinds of grasses, years on soils upon which the *Mexican Fox-tail Grass* grows very well, and it is much more productive than the other kinds of grasses. It has likewise by some been found to be much more productive than the other kinds of grasses, and it is much more productive than the other kinds of grasses. Others speak of it as excellent, both for pasture and for hay, and it is much more productive than the other kinds of grasses, and the first as a dairy grass. The seed is much more productive than the other kinds of grasses, according to the accounts of some accurate observers, but a great number of insects, in certain seasons, are liable to be destroyed by a very common species of caterpillar, or maggot, which feeds on the embryo of the seed, and it is much more productive than the other kinds of grasses, small species of fly.

\* *Alopecurus pratensis*.

§ Curtis's Observations.

¶ Mr. Majendie.

†† Martyn's *Flora Rustica*, Vol. I. and Curtis's Observations.



RAIL GRASS.

PL. VI.  
Col. p. 233





*Meadow Fox-tail Grass*\*.—Is a sort of grass that sends forth its spike almost as soon, and in some situations full as early, as the Sweet-scented Vernal: consequently it is equally valuable as an early grass; and as it is much larger and quicker in its growth, it is of course much more productive: it shoots very rapidly after mowing, producing a very plentiful aftermath: and where the land is rich, and two crops are not thought too much for it to bear, of all the grasses of this climate it appears to be the most adapted for such a purpose, and ought to form a principal part of the crop in such cases. Its foliage may seem coarse to some; but it must be kept in mind that no grass can be productive that is not in some degree coarse. If it be mown early, just as it comes into bloom, though the leaves are large, the hay will not, however, be coarse. In general, the great advantage proceeding from the earliness of these two grasses is entirely lost in those districts where hay-making begins at a late period, and where a crop of indiscriminate herbage is waited for by the cultivator.

It is in some measure distinguished by the largeness of its foliage, and by its producing a soft spike on a long stalk about the beginning of May. This is a great objection to it, as the seed cannot be always obtained in plenty†. On a situation where it was perfectly established with thick herbage it was found to produce but few seed-stems‡.

In respect to the places of its growth, it is more confined than the first sort, growing naturally in a moist soil only: on this account some think it best adapted for improving such wet grounds as may be drained of their superfluous moisture, or for forming or meliorating meadows that have a moist bottom, and are not apt to be burnt up in dry summer seasons§. Others, however, suppose that there is scarcely a better grass for moist loams and clays, as it is extremely early; and abides nine or ten years on soils upon which the Meadow Fescue gives way to those of other kinds||. It has likewise by some been found hardier against frost and excessive cold¶. Others speak of it as excellent, both for pasture and hay, as being highly productive, and the first as a dairy grass\*\*. The seeds are easily collected, according to the accounts of some accurate observers††; but a great number of them, in certain seasons, are liable to be destroyed by a very minute orange-coloured *larva*, or maggot, which feeds on the embryo of the seed, and most probably produces some small species of fly‡‡.

\* *Alopecurus pratensis*.

† Young in Communications, &amp;c. Vol. III.

‡ Ibid.

§ Curtis's Observations.

|| Young in Communications to the Board of Agriculture, Vol. III.

¶ Mr. Majendie.

\*\* Sole in Bath Papers, Vol. IX.

†† Martyn's *Flora Rustica*, Vol. I. and Curtis's Observations.

‡‡ Ibid.



*Great or Smooth-stalked Meadow Grass*\*.—In this grass the foliage also begins to shoot and to assume a beautiful verdure at an early period in the spring; but the flowering stems are not produced so soon, by a week at least, as those of the last: this slight difference, in point of earliness of flowering, does not, however, prevent it from being properly ranked with the two preceding grasses. Where early grassy pasturage is the great object of the cultivator, it cannot probably be better obtained than by a judicious combination of these three grasses. If quantity of crop be at the same time in view, the Meadow Fox-tail Grass should predominate in a considerable degree †.

It in some measure affects a rather dry than a moist situation, on which account it keeps its verdure in long-continued dry seasons better than most other sorts; but it is capable of thriving in either pretty well, though more luxuriantly in rich meadows. It is liable to some objection from its creeping root, which when established is difficult to extirpate: it should of course be cautiously introduced where the land is not intended to remain in a permanent state of sward ‡.

By some it is considered, however, as a highly valuable grass, as all animals are fond of it; and it affords the best hay, as well as the richest pasturage. In addition to its other qualities, it has the property of abiding continually in the same ground, while most other sorts are liable to change §. On rich loams it has been found, by some, a highly valuable grass, succeeding well with different cultivators ||.

According to Mr. Curtis, this grass is now readily distinguished from the Common or Rough-stalked Meadow Grass, as it has a smooth stalk, while the other has a rough one, which is perceptible when drawn betwixt the thumb and finger, and which proceeds from little sharp points, visible when the sheath of the leaf, which covers the stalk, is magnified: besides, the latter has a long pointed membrane at the base of the leaf, while in the former it is a short blunt one. And further, it only throws up flowering-stems or bents once in a season; from which peculiarity, combined with its hardness and verdure, it appears well suited for the lawns or grass-plats of pleasure-grounds.

Notwithstanding what has been just observed in regard to its property of remaining in the land; in dry soils the crop from this grass has sometimes been found to diminish in quantity annually, and to become ultimately very small, especially

\* *Poa pratensis*.

† Curtis's Practical Observations.

‡ Curtis in Ibid.

§ Major Cartwright.

|| See in Bath Papers, Vol. IX.



SMOOTH STALKED MEADOW GRASS.

*Poa pratensis*.





*Smooth-stalked Meadow Grass* is a beautiful variety, which begins to grow in the spring; but the quantity of crop produced is not, at least, as those of the last: it does not, however, prevent the growth of the other grasses. Where early grassy crops are required, it probably be better obtained if quantity of crop be at all times. *Smooth-stalked Meadow Grass* should predominate in a

pasture, on which account it is better suited to the soil than most other sorts; it grows more luxuriantly in rich soil, though more luxuriantly in rich soil. It has a creeping root, which when introduced be cautiously introduced into a sward of sward.

It is a highly valuable grass, as all animals feed on it as well as the richest pasturage. In the property of abiding continually in the same ground, while most other sorts are liable to change. On rich loams it has been found, by some, a highly valuable grass, succeeding well with different cul-

According to Mr. Curtis, this grass is now readily distinguished from the Common or Rough-stalked Meadow Grass, as it has a smooth stalk, while the other has a rough one, which is perceptible when drawn betwixt the thumb and finger, and which is made from little sharp points, visible when the sheath of the leaf, which is magnified; besides, the latter has a long pointed membrane at the base of the leaf, while in the former it is a short blunt one. And further, it does not bend or bents once in a season; from which peculiarities and verdure, it appears well suited for the

Naturalists have been just observed in regard to its property of growing on dry soils the crop from this grass has sometimes been found to diminish annually, and to become ultimately very small, especially

\* Curtis's Practical Observations.

† Major Cartwright.

‡ See his Papers, Vol. IX.



SMOOTH STALK'D MEADOW GRASS.  
(*Poa pratensis.*)

PL. VII  
Vel 2. p. 826





THE JOURNAL OF  
JAMES M. SMITH  
1847-1848





THE GARDEN OF THE  
GODS





MEADOW FESCUE GRASS.  
(*Festuca pratensis.*)

PL. IX  
Vol 2 p. 827







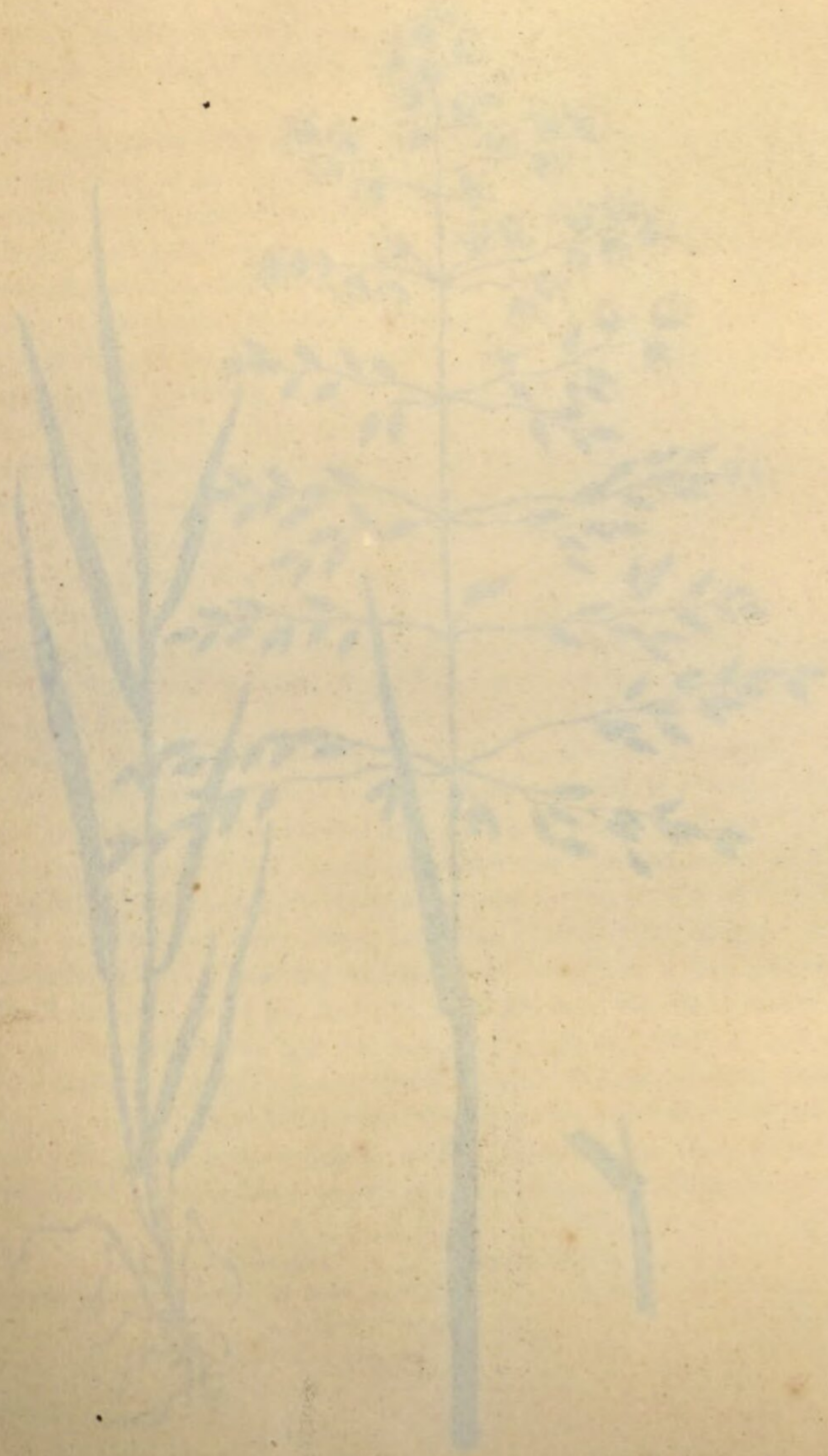


WILLOW FESCUE GRASS.

PLATE  
Vol. 2 p. 227









ROUGH STALKD MEADOW GRASS.  
(*Poa trivialis.*)

PL. VIII  
Vol. 2. p. 627





when the roots have become matted, and exhausted the ground, which they seem much disposed to do; but in moist meadows this effect has not been so much noticed.\*

*Common or Rough-stalked Meadow Grass* †. — Though this grass has much similarity to the preceding in its appearance, especially in the mode of flowering, it differs essentially in its qualities, as the former is chiefly found in dry pastures, while the latter principally occurs in moist meadows. It delights in moisture, and situations that are sheltered; on which account, though there are few more productive, or better adapted for the purpose of hay or pasturage, it is tender, and liable to be injured by severe cold or drought; and in moist rich ground it has been observed to grow tall, while in poor land it has been found equally diminutive.

It is said by some cultivators to be a grass well adapted to good, sound, moist loams. On the continent it is greatly esteemed both for dry pastures and water meadows, as it multiplies much by seed as well as root. It is therefore necessary to permit the seeds to fall, in order to preserve the quantity undiminished. The produce is admirable for the feeding of all sorts of cattle ‡. It is, however, considered by some as inferior to the last sort, from its property of going off after being cut, being supplanted by those of the bent kind: but its radical as well as stem-leaves grow larger §.

As the seeds of this as well as those of the last sort are apt to be entangled, and adhere to each other, it is difficult to disperse them evenly in sowing. This circumstance should therefore be attended to in putting them into the land.

*Meadow Fescue Grass* ||. — This is a grass that comes near in its appearance to Ray Grass, but to which it seems greatly superior, at least for the purpose of forming or improving meadows; as being larger, and more productive of silage. It is strictly perennial and hardy, thriving well not only in wet but in dry grounds; growing in all situations, from the sand-pits at Charlton to the oyster-grounds at Battersea; and it abounds in the best meadows, in the best hay districts: in short, it seems well calculated to supply the defects of Ray Grass. Besides, it has the quality of producing more seeds than most of the other sorts of grasses, which are easily gathered, and grow readily. It is however inferior to the three first of the above grasses in one property, which is, that it does not produce its flowering-stems sooner than the

\* Curtis's Observations.

† *Poa trivialis*.

‡ Young in Communications to the Board, Sec. Vol. III.

§ See in each paper.

|| *Festuca pratensis*.







when the roots have become matted, and exhausted the ground, which they seem much disposed to do; but in moist meadows this effect has not been so much noticed\*.

*Common or Rough-stalked Meadow Grass* †.—Though this grass has much similarity to the preceding in its appearance, especially in the mode of flowering, it differs essentially in its qualities, as the former is chiefly found in dry pastures, while the latter principally occurs in moist meadows. It delights in moisture, and situations that are sheltered; on which account, though there are few more productive, or better adapted for the purpose of hay or pasturage, it is tender, and liable to be injured by severe cold or drought: and in moist rich ground it has been observed to grow tall, while in poor land it has been found equally diminutive.

It is said by some cultivators to be a grass well adapted to good, sound, moist loams. On the continent it is greatly esteemed both for dry pastures and water meadows, as it multiplies much by seed as well as root. It is therefore necessary to permit the seeds to fall, in order to preserve the quantity undiminished. The produce is admirable for the feeding of all sorts of cattle ‡. It is, however, considered by some as inferior to the last sort, from its property of going off after being cut, being supplanted by those of the bent kind: but its radical as well as stem-leaves grow larger §.

As the seeds of this as well as those of the last sort are apt to be entangled, and adhere to each other, it is difficult to disperse them evenly in sowing. This circumstance should therefore be attended to in putting them into the land.

*Meadow Fescue Grass* ||.—This is a grass that comes near in its appearance to Ray Grass, but to which it seems greatly superior, at least for the purpose of forming or improving meadows; as being larger, and more productive of foliage. It is strictly perennial and hardy, thriving well not only in wet but in dry grounds; growing in all situations, from the sand-pits at Charlton to the osier-grounds at Battersea; and it abounds in the best meadows, in the best hay districts: in short, it seems well calculated to supply the defects of Ray Grass. Besides, it has the quality of producing more seeds than most of the other sorts of grasses, which are easily gathered, and grow readily. It is however inferior to the three first of the above grasses in one property, which is, that it does not produce its flowering-stems sooner than about

\* Curtis's Observations.

† *Poa trivialis*.

‡ Young in Communications to the Board, &c. Vol. III.

§ Sole in Bath Papers.

|| *Festuca pratensis*.



the middle of June, which is a fortnight or three weeks later than the second of them; though it cannot be considered as a late grass, as those of the bent and some other sorts flower later by three weeks or more\*.

*Sheep's Fescue* †.—This grass has been much praised by some, both for the purposes of pasture and hay; sheep and other sorts of live stock being very fond of it, and soon rendered fat in pastures where it prevails. But from its affording in dry heathy exposed situations, and commons, but a very small produce, and its foliage being hard and wiry, as well as from its appearance in dry summers being unpleasantly brown; and in rich moist ones, where the foliage retains its verdure, and becomes much taller; from its being in its nature a small plant, it cannot be productive, consequently cannot be considered as in any way fit for a hay grass ‡. It is said by some to be capable of thriving on any soil, but best on those of the light spongy kinds, as it can live with less moisture than most other grasses. And it is asserted to be one of the excellencies of this grass, that it will establish itself upon such soils as scarcely any other plant can be made to succeed on; being of course of much utility in covering barren spots, that might otherwise have remained uncovered for a great length of time §.

Others however observe, that if it were sown on rich moist soils, the grasses and other plants, which are natural to such lands and situations, would soon overpower it, and in a very short time there would scarcely be a blade remaining to be seen on the ground. And were it for the purpose of sheep feed to be sown on the high down and heath lands, the animals would starve upon them in dry summer seasons ||. Where a close matted turf, without a great produce, is required, it may, however, be found useful.

*Hard Fescue* ¶.—This is an early and productive grass, with fine foliage, which grows well on downs and rich meadows. It is well adapted for being combined with other grasses in forming sheep pastures\*\*; and by some it is said to constitute the best hay.

*Crested Dog's-tail Grass* ††.—This is a grass that has been much recommended as a favourite and wholesome food for sheep. It is found in the soundest and best pastures, but grows best in dry situations, and will not thrive in meadows that are very moist. It flowers nearly at the same time as the Meadow Fescue Grass, but is not very productive of foliage ‡‡. The appearance of its bents in poor, high,

\* Curtis's Observations.

† *Festuca ovina.*

‡ Anderson's Essays, Vol. II.

§ Curtis's Observations, &c.

|| Curtis's Observations.

¶ *Festuca duriuscula.*

\*\* Sole in Bath Papers, Vol. IX.

†† *Cynosurus cristatus.*

‡‡ Ibid.







...later than the second of  
...as those of the bear and

...by some, both for the pur-  
...stock being very fond of it,  
...from its affording in dry  
...small produce, and its foliage  
...dry summers being unplea-  
...retains its verdure, and  
...plant, it cannot be pro-  
...for a hay grass †. It is  
...best on those of the light  
...other grasses. And it is  
...will establish itself upon  
...succeed on; being of course  
...otherwise have remained

...soils, the grasses and  
...would soon overpower  
...blade remaining to be seen  
...And were they sown on the high  
...down and heath lands, the autumn  
...them in dry summer seasons †.  
Where a close matted turf  
...produce, is required, it may, how-  
ever, be found useful.

*Hard Fescue.*—This grass, with fine foliage, which grows  
well on downs and is  
other grasses in  
best hay.

*Crofted Dog's Tail Grass.*—This grass has been much recommended as  
a forage for cattle, and is found in the soundest and best  
pastures, but will not thrive in meadows that are  
very damp. It is as the Meadow Fescue Grass, but  
its appearance of its bents in poor, high,

† Curtis's Observations, &c.  
\*\* Sole in Bath Papers, Vol. IX,  
11: 181.



SHEEPS FESCUE GRASS.  
(*Festuca ovina*.)

PL. X  
Vol. 2. p. 828









HARD FESCUE GRASS  
(*Festuca duranensis*)









*HARD FESCUE GRASS.*  
(*Festuca duriuscula.*)

PL. XI  
Vol. 2. p. 328





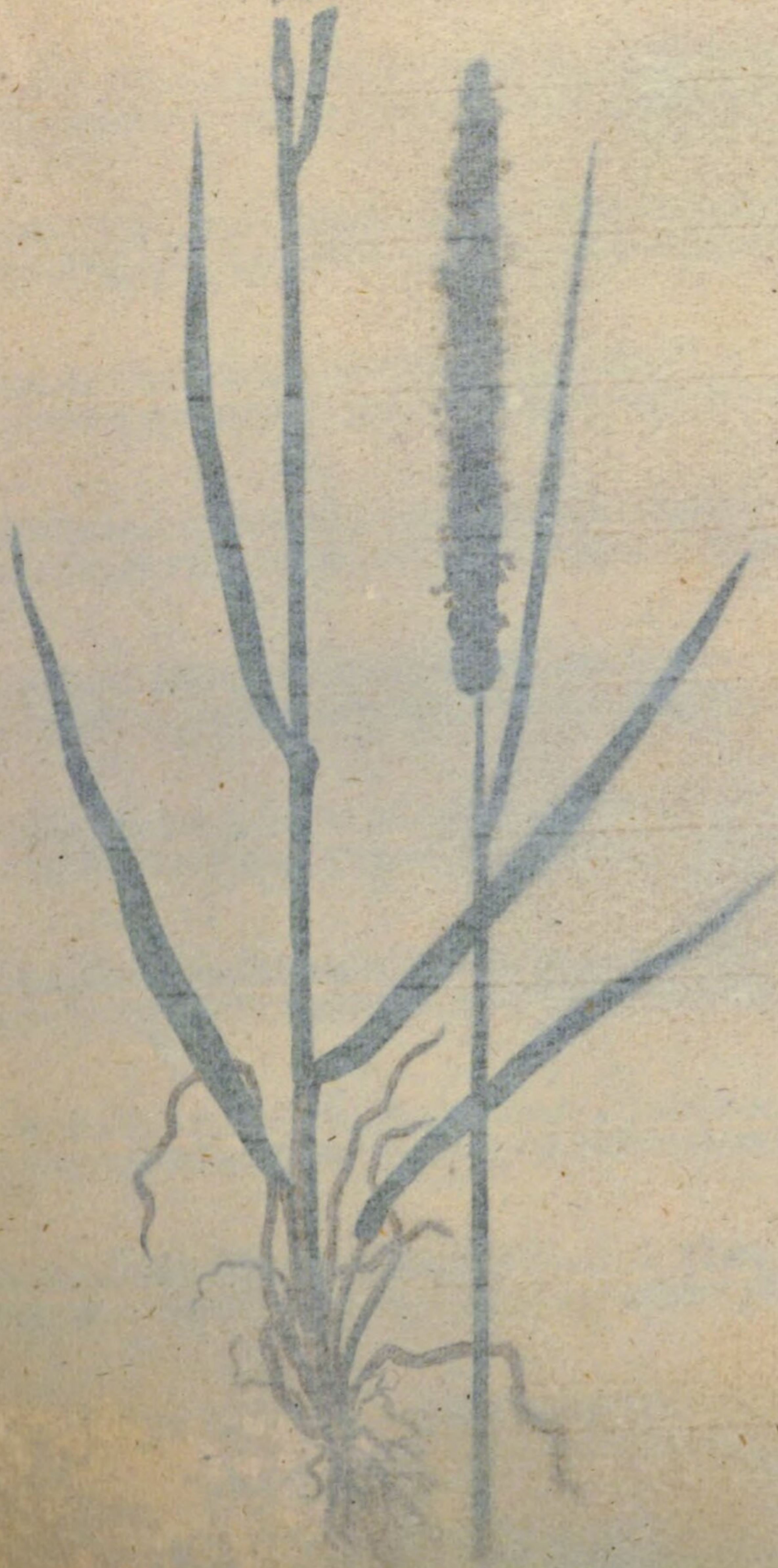




CRESTED DOG-TAIL GRASS

(*Cynodorus cristatus*)

PL. 12  
1812









CRESTED DOGSTAIL GRASS.  
(*Cynosurus cristatus*.)

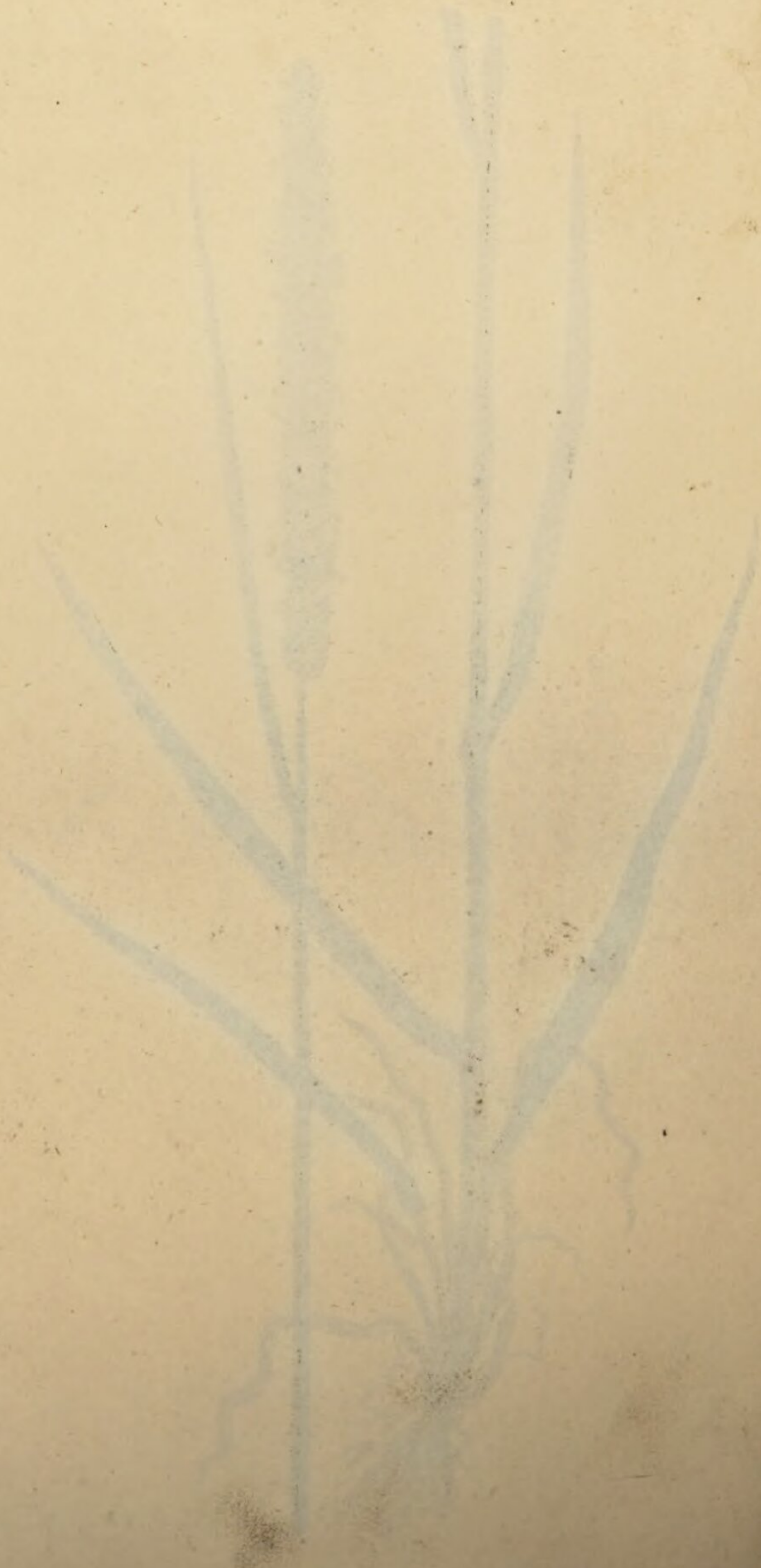
PL. XII  
Vol. 2. p. 828





THE NEW YORK PUBLIC LIBRARY

ASTOR LENOX TILDEN FOUNDATION





THE  
LIBRARY OF THE  
MUSEUM OF NATURAL HISTORY



13

X

1880



COMMON RAY GRASS.

(*Lolium perenne*.)

PL. XIII  
Vol. 2. p. 829





moist pastures, suggests the idea of its being an indifferent plant. But its abounding in most of the richest grazing pastures in different parts of the kingdom, and its being in some the principal herbage, leads us to conclude that it is a useful grass\*. As its flowering stems and heads are seldom consumed by cattle, its seeds may be collected, where the pastures are fed, with great facility; and, as they are abundant, may be gathered by children at about one shilling the pound.

Land may be laid down with it in a successful manner, if proper attention be bestowed in having the seed collected when fully ripe, as it has been known to fail on this account†. On the continent it is in high estimation as a pasture grass‡. From the fibrous nature of its roots, not admitting the running down much into the soil, there may be danger of its being destroyed in dry summer seasons.

As it abounds greatly in the best pastures, and is a blade grass that shoots up the first after the land has been mown, its thickest tufts are said to afford much food for sheep in the time of snow and severe weather in the winter season. This, when we are not accustomed to distinguish the difference of grasses with much accuracy, may be observed, despite it, as of an improper and useless kind; but the sheep and ox, who must be allowed better judges, will soon convince them of its importance. From the rapidity of its growth it may be apt to get coarse, if not cut down more quickly than is often the case. The seed is small and fine, but may be obtained with much facility by passing the stem in a tight manner through the hand. It has been procured at sixpence the quart§.

*Ray or Rye Grass*¶.—This is a sort of grass that has been much in cultivation, but is deficient in some of the properties necessary for meadow or pasture lands. The objection on the score of its producing little more than flower-stems or heads, is said to be only found valid when it grows in upland pastures and dry situations; in rich moist meadows its foliage is more abundant; and it seems probable that it is highly acceptable and nutritious in feeding cattle: its foliage is of rapid growth, the flowering stems continually shooting forth¶. It is, however, a grass that varies greatly, according to situation and circumstances.

It is best adapted to the loamy and sandy descriptions of soils; but it will succeed on any except stiff clay, and even on that it may be grown. On the

\* Young in Communications, &c. Vol. III. and Marshall's Rural Economy.

† Atti di Milano, var. loc.

‡ Goring in Communications to the Board of Agriculture.

§

|| *Lolium perenne*

¶ Curtis's Observation



PLANTY FINE & PASS.

1800

PL. XII  
Vol. II. p. 519



11



moist pastures, suggests the idea of its being an indifferent plant. But its abounding in most of the richest grazing pastures in different parts of the kingdom, and its being in some the principal herbage, leads us to conclude that it is an useful grass\*. As its flowering stems and heads are seldom consumed by cattle, its seeds may be collected, where the pastures are fed, with great facility; and, as they are abundant, may be gathered by children at about one shilling the pound.

Land may be laid down with it in a successful manner, if proper attention be bestowed in having the seed collected when fully ripe, as it has been known to fail on this account†. On the continent it is in high estimation as a pasture grass‡. From the fibrous nature of its roots, not admitting the running down much into the soil, there may be danger of its being destroyed in dry summer seasons.

As it abounds greatly in the best pastures, and is a blade grass that shoots up the first after the land has been mown, its thickest tufts are said to afford much food for sheep in the time of snow and severe weather in the winter season. Those who are not accustomed to distinguish the difference of grasses with much accuracy, may, it is observed, despise it, as of an improper and useless kind; but the sheep and the ox, who must be allowed better judges, will soon convince them of its importance. From the rapidity of its growth it may be apt to get coarse, if not cut down more quickly than is often the case. The seed is small and fine, but may be obtained with much facility by passing the stem in a tight manner through the hand. It has been procured at sixpence the quart§.

*Ray or Rye Grass*||.—This is a sort of grass that has been much in cultivation, but is deficient in some of the properties necessary for meadow or pasture lands. The objection on the score of its producing little more than flower-stems or bents, is said to be only found valid when it grows in upland pastures and dry situations: in rich moist meadows its foliage is more abundant; and it seems probable that it is highly acceptable and nutritious in feeding cattle: its foliage is of rapid growth, the flowering stems continually shooting forth¶. It is, however, a grass that varies greatly, according to situation and circumstances.

It is best adapted to the loamy and sandy descriptions of soils; but it will succeed on any except stiff clay, and even on that it may be grown. On the richer

\* Young in Communications, &c. Vol. III. and Marshall's Rural Economy.

† Ibid.

‡ Atti di Milano, var. loc.

§ Goring in Communications to the Board of Agriculture, Vol. III.

|| *Lolium perenne*.

¶ Curtis's Observations.



sorts of the two first kinds of land, it frequently turns out both a good vernal and permanent pasture grass when employed in due mixture with other sorts; and it is particularly suited to be fed by sheep\*. It is not, however, so early as some of the grasses that have been described above.

Some of the varieties of this grass, as those cultivated by Mr. Peacey, are said to be much superior to the common kind, by those who have had great experience of them.

Some cultivators suppose the reason of its not producing a thick well-connected sward in some situations is, that it is only suited to lands that are in a rich and fertile condition, though it may be occasionally found in those of the contrary kind. It is, indeed, well observed by an intelligent writer, that "when land is in a proper state of manure, ray-grass, united with white clover, will form a perfect sward the latter end of the second year after it is sown. A particular field, of about five acres, that was sown with these two grasses only, was more perfectly grassed over than others, which had the addition of trefoil and rib grass, and which were sown at the same time. A neighbour of his, the only man in the country that had tried ray-grass, told him it would not answer, and referred him to a particular field where some had been sown. The fact was, that he had cropped this field with oats, until it was no longer worth ploughing; and then, with his last seed, he sowed ray-grass, which certainly did not flourish. But his argument would have been equally conclusive against any grass or grain whatever. The ray-grass languished, and, finally, died away, giving place to the vegetation suited to the state of the land. If it be expected that ray-grass, or any other good grass, should thrive and produce abundant crops on exhausted or poor land, it must not be sown in the soil which occurs here†.

The following remarks of the same author are deserving of the notice of the cultivator: "On converting ray-grass into hay, it is necessary he says to cut it at a period previous to its being so ripe as to have perfected its seed, and changed to a yellow colour; for in this case a great part of the juices of the plant, which constitute a principal part of the nutriment it is to afford, will be converted into a species of straw, and its nutritive properties be proportionably diminished. When it is made into hay, persons not acquainted with its qualities are apt to object to its apparent coarseness, which proceeds from its consisting

\* Young in Communications to the Board, &c. Vol. III.

† Campbell in Communications to the Board, &c. Vol. III.



almost entirely of flowering-stems, the ray-grass having a comparatively smaller proportion of leaves than any other grass. Whether this be a defect or a merit, will, he thinks, depend upon a solution of this question: Do the stems and flowering parts of grass, or the leaves, taken weight for weight, contain the greater proportion of nutriment? It does not appear that this has been determined by experiments instituted for the purpose; but it seems probable, from the stems being so much sweeter than the leaves, (which is particularly perceptible upon chewing them when about half dry,) and from those vegetables which contain much saccharine matter being particularly nutritious, that the greater proportionate quantity of nutriment will be found to reside in the stalks; and if so, the advantages of ray-grass will be decisive. But, however this may be, it is certain that, supposing wet weather comes on during the process of hay-making, the first part of the grass that decays is the leaf, which soon becomes yellow, and then black, losing all pretensions to nutritive properties; in which case, it is evident that almost the whole nutriment contained in the hay must reside, exclusively, in the flowering-stalks. Ray-grass then has, in unfavourable hay seasons, an advantage over all others, inasmuch as, from having fewer leaves, it is not so apt to be injured by a continuance of rain: and it is besides, when in the cocks, more accessible to the air and wind, from lying more open and light; and consequently not so apt to heat and mould as other grasses in similar situations and seasons."

On the whole, he conceives that "it certainly possesses the following valuable properties: 1. That there are few grasses so early in the spring. 2. That there are none better relished by cattle, or more nutritive. 3. That it has the power of resisting the effects of bad weather, in ticklish hay seasons, in a greater degree than other grasses. 4. That there is a greater facility in collecting its seed than of any other grass."

It is conceived that the prejudices against it have arisen, 1. "From its having been sown in land not capable of producing a full crop of any good vegetable. 2. From allowing it to shoot up so far as to have formed the seed in the flowering-stalk, before cattle have been turned into pasture, or that it has been cut for hay. Ray-grass appears to partake more of the nature of grain than any other grass. Hence, when it has perfected its seeds, it shoots out no more stalks, and but few leaves that season, as lord Kaimes has justly observed. Hence it is necessary to turn cattle into a field of this grass early in the spring, and to keep it well under by a sufficient quantity of stock; in which case it will continue to put out fresh flowering stalks and leaves during the whole season. 3. The hay, for the reasons



just assigned, should be cut before it becomes a mere straw. Common hay grass, being composed of grasses in various stages of growth and ripeness, admits of a greater latitude than a field of ray-grass, because many of them will generally be in a proper state for cutting, although others may have passed their prime."

The following facts, adduced by this accurate observer, fully establish its nutritive properties: "No hay he says could be better relished by his horses than this was; not a particle of it was wasted by them, or left in the rack; no animals could thrive, coat, or do their work better than they did, whilst they had this ray grass hay to take to. Never was there a greater contrast than when they were put to the natural hay grass of the country after they had finished the other. They were literally starved into the eating it; and in spite of an additional quantity of corn they fell away, (agreeably to his farming man's mode of expression) a limb a-piece. This year nothing can look better than his horses do upon this hay, (with which some red clover is mixed,) and this, with the addition of very little corn, and that mostly light, the tailings of oats and barley."

*Meadow Soft Grass, or Yorkshire White\**.—It is common in meadows and pastures, and is hardy and productive of foliage, but flowers much later than the first of the above grasses: its foliage is soft and woolly†. It thrives best on soils of the more moist kinds; but may be grown on almost any that are not very dry and in poor condition; and even on these it is sometimes met with. By some cultivators it is chiefly advised to be made use of with a view to sheep pasture, as it has not been found equally good for other sorts of stock. And it has been found to answer best when kept very closely fed‡. It has been supposed useful for neat cattle, but very indifferent for horses§.

It grows in a quick manner, and affords good sheep-feed in the winter season; and would seem, from the following fact, to be much relished by live stock: on two fields being laid down adjoining each other, one with this grass, and the other with rye-grass (*Lolium perenne*,) the former was eaten much closer than the latter, by the stock turned upon them||.

*Rough Cock's-foot Grass¶*.—This is a coarse, rough grass, but very hardy and

\* *Holcus lanatus*.

† Curtis's Practical Observations.

‡ Young in Communications to the Board, &c. Vol. III.

§ Marshall's Rural Economy of the Midland Counties.

|| Goring in Communications to the Board, &c. Vol. I.

¶ *Dactylis glomerata*.







ROUGH COCKS FOOT GRASS.  
(*Dactylus glomeratus.*)

PL. XIV  
Vol. 2. p. 833





productive. It is common in meadows; and rather early\*. Some condemn it as not only an indifferent grass, but one that is often rejected by cattle†. Others, however, on the authority of experience, consider it as highly valuable on moist loams where the bottom is of a clayey marl nature; and in cases where the grasses of a finer kind are liable to be overpowered and destroyed by those plants that are common to the soil. When it is kept very closely fed down, it constitutes excellent pasturage for sheep; but when this is neglected, like many other grasses, it gets coarse: if sown with red clover, in the proportion of two bushels of the grass seeds to ten pounds of the clover, it forms a better sward; for, as the latter wears out or disappears, the former resumes its place, and lasts better in the land. It is a grass that vegetates better during the winter season than many others‡. It affords much seed, and which may be gathered at but little expense, is about four times the bushels. It has been found highly beneficial in affording an early feed for sheep§.

*Tall Oat Grass* ¶.—This is a grass sometimes found abundantly in meadows. It is early, coarse, and productive; but affords a plentiful after-crop. In excellence it approaches the meadow fox-tail, for which it may, in many cases, prove an indifferent substitute\*\*. It is cultivated on the continent with advantage††.

This, like the preceding grass, is found the most beneficial when retained in a close state of seeding‡‡. It makes good hay, and experiment has shown it to afford a greater weight of produce than most other grasses§§. On the continent, in comparison with common grass, it is found to yield in the proportion of twenty to two||.

*Meadow Cat's-Tail Grass, or Timothy* ¶¶.—This grass succeeds best in moist soils and situations; is very productive, but coarse and late. It possesses no advantages over the meadow fox-tail‡. It is the most proper for clays, the moister kinds of loams, and those of the peat nature. When cultivated on moist loams with a substratum of the clayey marl description, it has been found on trial very useful, especially when kept closely fed down by sheep§. According to the accounts of travellers in America,

\* Curtis's Observations, &c.

† Bosé in Bath Papers, Vol. IX.

‡ Young in Communications to the Board, &c. Vol. III.

§ Ibid.

¶ Young's Eastern Tour, Vol. I.

¶ *Avena sativa*.

\*\* Curtis's Practical Observations.

‡ Annals of Agriculture.

‡‡ Young in Communications, &c. Vol. III.

§ Swayne's *Gramina Pastura*, Fol. edit.

§§ Obs. Soc. de Bretagne pour l'Année 1759.

¶¶ *Phleum pratense*.

‡ Curtis's Practical Observations.

§ Young in Communications, &c.



GRASS.

PL. IV.  
Grass.





productive. It is common in meadows; and rather early\*. Some condemn it as not only an indifferent grass, but one that is often rejected by cattle†. Others, however, on the authority of experience, consider it as highly valuable on moist loams where the bottom is of a clayey marl nature; and in cases where the grasses of a finer kind are liable to be overpowered and destroyed by those plants that are common to the soil. When it is kept very closely fed down, it constitutes excellent pasturage for sheep; but when this is neglected, like many other grasses, it gets coarse: if sown with red clover, in the proportion of two bushels of the grass seeds to ten pounds of the clover, it forms a better sward; for, as the latter wears out or disappears, the former resumes its place, and lasts better in the land. It is a grass that vegetates better during the winter season than many others‡. It affords much feed, and which may be gathered at but little expense, as about four shillings the bushel§. It has been found highly beneficial in affording an early feed for sheep||.

*Tall Oat Grass* ¶.—This is a grass sometimes found abundantly in meadows. It is early, coarse, and productive; but affords a plentiful aftermath. In excellence it approaches the meadow fox-tail, for which it may, in many cases, prove no indifferent substitute\*\*. It is cultivated on the continent with advantage††.

This, like the preceding grass, is found the most beneficial when retained in a close state of feeding‡‡. It makes good hay, and experiment has shown it to afford a greater weight of produce than most other grasses§§. On the continent, in comparison with common grass, it is found to yield in the proportion of twenty to two|||.

*Meadow Cat's-Tail Grass, or Timothy* ¶¶.—This grass succeeds best in moist soils and situations, is very productive, but coarse and late. It possesses no advantages over the meadow fox-tail‡. It is the most proper for clays, the moister kinds of loams, and those of the peat nature. When cultivated on moist loams with a substratum of the clayey marl description, it has been found on trial very useful, especially when kept closely fed down by sheep||. According to the accounts of travellers in America,

\* Curtis's Observations, &c.

† Sole in Bath Papers, Vol. IX.

‡ Young in Communications to the Board, &c. Vol. III.

§ Ibid.

|| Young's Eastern Tour, Vol. I.

¶ *Avena elatior*.

\*\* Curtis's Practical Observations.

‡‡ Annals of Agriculture.

§§ Young in Communications, &c. Vol. III.

||| Swayne's *Gramina Pascua*, Fol. edit.

||| Obs. Soc. de Bretagne pour l'Année 1759.

¶¶ *Pbleum pratense*.

‡ Curtis's Practical Observations.

|| Young in Communications, &c.



it constitutes the principal support of cattle and other animals, wherever the lands are of the meadow kind. It affords plenty of feed, of which a bushel is said by some to be sufficient, when mixed with those of other sorts, to sow four or five acres of land. They are capable of being procured in a perfectly clean state from America, in any proportion, at the easy expense of about a guinea the bushel\*.

*Hay-Seeds.*—These are the seeds collected in hay-lofts and chambers, or from under the stacks; and must of course be a mixture of the seeds of various sorts of grasses, both good and bad, as well as of other sorts of plants that may have been upon the land from which the hay was taken. They should consequently never be indiscriminately made use of in laying down lands to the state of sward, as has been the too common practice. The only way in which they can be used with propriety is, by selecting them from the best grasses on the fields after their being cut down, and afterwards threshing them out, as by this means the seeds of the bad and improper plants may avoid being mixed and blended with those that are valuable and of the proper sorts. Another method has been advised by an able practical cultivator, which is that of taking them from such old pasture meadow, or marsh lands, as abound in grasses of the best kinds; being careful that the soils from which they are taken be similar to those on which they are to be sown; and instead of cutting them at the common period of hay-time, to let them stand till the yellow oat grass begins to turn its colour, which being one of the latest kinds, all the others will have attained perfection: they should then be cut down, and afterwards threshed out on a cloth in the field, or secured to be threshed in the winter season †. But in this way, with the greatest care, improper and useless plants may often be propagated.

There are other plants besides these that may be of great advantage in laying down lands to grass, by the large quantity of herbage they produce, such as the following:

*Yarrow* ‡.—This is a plant that sends forth a great abundance of leaves, which constitute good herbage, and which are consumed with great avidity by cattle and sheep; but from the flower-stems being sometimes rejected, it has been too much neglected. It forms the principal herbage in many fine rich pastures; but where they are kept closely fed down is but little perceived §. It is predominant on moist, loamy soils, in nearly an equal degree as on those of the dry, burning, sandy, gravelly, or chalky kinds. It is of much utility in resisting the effects of drought in the most dry, parched, close-fed lands; often preserving the spots where it prevails in a green state, while others are burnt up and become quite brown. It is said to

\* Young in Communications, &c. † Boys in Communications to the Board of Agriculture, Vol. III.

‡ *Achillea Millefolium*.

§ Anderson's Essays.



WHITE BERRY CLUSTER





**DUTCH OR WHITE CLOVER.**  
(*Trifolium repens.*)

PL. XV  
Vol. 2. p. 83.





answer well, when cultivated with a view to be fed by sheep. It is therefore a plant of much value, and which deserves greater attention than has hitherto been bestowed upon it\*. The seeds may be collected in October, without much difficulty, and at the rate of about five shillings the bushel†.

*White Clover* †. — This has been greatly depended upon by most cultivators, in bringing lands into a state of sward. It is an extremely useful plant on the more rich and dry, sandy and loamy soils, as well as in the clayey and peaty descriptions of land, where they have been well drained from moisture: but on the more wet and poorer sorts of loamy and clayey lands, it is not by any means so proper or useful, as it is not lasting, but gives place to plants of the aquatic kind, as well as others of an indifferent description. It is supposed by some not to afford so sweet an herbage as broad clover or many other plants: with us it has, however, always been eagerly fed upon both by sheep and neat cattle; and where closely fed down, we have little doubt of its great utility. That which comes up naturally by the application of manure is said to be much more hardy than that which is sown, as well as more lasting in the soil‡. It has been justly remarked as a proof of good land, that it runs quickly, of its own accord, to this plant§. It may be introduced with most sorts of seeds, and contribute greatly to the success of the cultivator.

*Cow-Grass* ¶. — This is usually known to farmers, under the title of Marl Grass. It is said to be a more lasting plant than the common red clover. On clayey soils and loamy ones of the stronger kind, it is found to be particularly useful and lasting\*\*. And its cultivation has been attempted on some of the weaker soils, with such success as to afford good crops††. The seed can be sown in great quantities with facility.

It is said to succeed well on all the heavier sorts of soil, and to be of great utility when sown with other grasses, where the lands are to remain in the state of grass‡‡. It is recommended to be sown on the stone-brash lands, in large proportions, with other sorts of clover, by an intelligent cultivator§§.

*Trefoil* |||. — This is another plant which is capable of succeeding on soils of different

\* Young in Communications, &c. Vol. III.

† *Trifolium repens.*

‡ Goring in Communications, &c. Vol. III.

|| Young in Communications, &c.

¶ *Trifolium medium.*

\*\* Young in Communications, &c.

†† Corrected Report of Lincolnshire.

‡‡ Sir John Sinclair in Communications, &c.

||| *Medicago lupulina.*



14. THE OR WHITE CLOVER.

*Trifolium repens* L.

PL. XV  
Ed. 1. 1. 1. 1.





answer well, when cultivated with a view to be fed by sheep. It is therefore a plant of much value, and which deserves greater attention than has hitherto been bestowed upon it\*. The seeds may be collected in October, without much difficulty, and at the rate of about five shillings the bushel†.

*White Clover* ‡.—This has been greatly depended upon by most cultivators, in bringing lands into a state of sward. It is an extremely useful plant on the more rich and dry, sandy and loamy soils, as well as in the clayey and peaty descriptions of land, where they have been well drained from moisture: but on the more wet and poorer sorts of loamy and clayey lands, it is not by any means so proper or useful, as it is not lasting, but gives place to plants of the aquatic kind, as well as others of an indifferent description. It is supposed by some not to afford so sweet an herbage as broad clover or many other plants: with us it has, however, always been eagerly fed upon both by sheep and neat cattle; and where closely fed down, we have little doubt of its great utility. That which comes up naturally by the application of manure is said to be much more hardy than that which is sown, as well as more lasting in the soil§. It has been justly remarked as a proof of good land, that it runs quickly, of its own accord, to this plant||. It may be introduced with most sorts of seeds, and contribute greatly to the success of the cultivator.

*Cow-Grass* ¶.—This is usually known to farmers, under the title of Marl Grass. It is said to be a more lasting plant than the common red clover. On clayey soils and loamy ones of the stronger kind, it is found to succeed to the greatest certainty\*\*. And its cultivation has been attempted on those of the sandy description, with such success as to afford good crops††. The seed can always be procured with facility.

It is said to succeed well on all the heavier sorts of soil, and to be of great utility when sown with other grasses, where the lands are to remain in the state of grass‡‡. It is recommended to be sown on the stone-brash lands, in large proportions, with other sorts of clover, by an intelligent cultivator§§.

*Trefoil* |||.—This is another plant which is capable of succeeding on soils of different

\* Young in Communications, &c. Vol. III. † Ibid.

‡ *Trifolium repens.* § Goring in Communications, &c. Vol. III. || Young in Communications, &c.

¶ *Trifolium medium.* \*\* Young in Communications, &c.

†† Corrected Report of Lincolnshire. ‡‡ Sir John Sinclair in Communications, &c. §§ Ibid.

||| *Medicago lupulina.*



kinds. It may be objected to as being only a biennial; but as it annually sheds much feed, it is said to seldom wear out of the lands on which it is established. This plant is often distinguished by the titles of *Nonfuch*, *Yellow Clover*, &c.

As it is always of much importance to the farmer to have the land he lays down for pasture to produce an ample crop the first year; and as there are some grasses or plants which require two or three years to establish themselves, and acquire their perfect growth, while others arrive at their extreme growth and expansion the first year after they are sown; some of the latter sort should be chosen, among which trefoil will be found highly valuable. This proves the advantage of mixing it with other sown grasses. Some think the quantity of four pounds of trefoil seed to the acre is too small; and intend in future either to double it, or add as much red clover seed, which may be more proper. In this quantity, it is supposed, they will not injure the other grass seeds sown at the same time, but furnish a copious vegetation until the others come to perfection, at which period both the trefoil and red clover have a natural tendency to disappear or wear out\*. The seed may be readily procured, and without much expense. It has likewise been found to answer on the stone-brash soils by Mr. Davies†. On chalky, and all the drier sorts of soil it is recommended as proper and beneficial‡.

*Rib Grass or Rib-wort Plantain*§. —This is a plant much relished by neat cattle and horses; and on grounds that are rather soft and porous, as sands and loams, in good heart, and which have a tendency to moisture, it affords a large produce of herbage; but on those that are very dry and binding, its produce is but scanty||. But on these it is asserted to answer for sheep-pasture, though inferior to others¶. It has been long established in some districts, where it is in much esteem for sheep-feed, but from its succulent nature improper for hay\*\*.

According to a late writer, it seems a good plant for thickening the bottom of the grass. Cattle are said to have a dislike to it, by some; but certainly the flowering-stems are here eagerly eaten by all sorts of stock. It is early in flower, and flourishes particularly in moss lands that have been drained in a perfect manner††. It affords seed in great plenty. *The Grass-leaved Plantain*‡‡ is also a plant capable of being employed with advantage in the laying down lands to pasture. It is said to succeed on barren soils and clays. It has the property of resisting the

\* Campbell in Communications to the Board, &c.

† Ibid.

‡ Boys in Ibid.

§ *Plantago lanceolata*.

|| Anderson's Essays, Vol. II.

¶ Ibid.

\*\* Marshall's Rural Economy of Yorkshire.

†† Ibid.

‡‡ *Plantago tenuifolia*.







It may be regarded to as being a biennial; but as it annually sheds its seed, it is seldom regarded as such on which it is established. This is a very common plant by the side of *Yellow Clover*, &c.

It is of great importance to the farmer to have the land he lays down covered with grass the first year; and as there are some grasses which require two or three years to establish themselves, and acquire their full growth, others arrive at their extreme growth and expansion the first year. The former sort should be chosen, among which *Red Grass* is highly valuable. This proves the advantage of mixing it with *Yellow Clover*. Some think the quantity of four pounds of trefoil seed to the acre is too small, and would either to double it, or add as much red clover seed to the same quantity. In this quantity, it is supposed, they will not furnish a copious vegetation at the same time, but furnish a copious vegetation at which period both the trefoil and red clover will be ready to decay or wear out\*. The seed may be readily procured, and without much expense. It has been found to answer on the most barren soils by Mr. Davies†. On chalky, and all the drier sorts of soil it is greatly benefited by manure and beneficial‡.

*Red Grass or Plantain*§. — This is a plant much relished by neat cattle and horses, and on grounds that are rather soft and porous, as sands and loams, in good nature, and which have a tendency to moisture, it affords a large produce of herbage; but on those that are very dry and binding, its produce is but scanty¶. But on these it is asserted to answer for sheep-pasture, though inferior to others¶. It has been long established in some districts, where it is in much esteem for sheep-feed, but from its succulent nature improper for hay\*\*.

According to a late writer, it seems a good plant for thickening the bottom of the ground. Cattle are said to have a dislike to it, by some; but certainly the flower-stems are much eaten by all sorts of stock. It is early in flower, and therefore good for mofs lands that have been drained in a perfect manner††. It grows in great plenty. *The Grass-leaved Plantain*‡‡ is also a plant capable of being employed with advantage in the laying down lands to pasture. It grows on barren soils and clays. It has the property of resisting the

\* Simpson, in his Observations to the Board, &c.

† Ibid.

‡ Boys in Ibid.

§ *Phlebotomus*.

¶ Anderson's Essays, Vol. II.

¶ Ibid.

\*\* *Blackberry*, &c. in *Yorkshire*.

†† Ibid.

‡‡ *Plantago scutellaria*.



TREFOIL OR BLACK NONSUCH.  
(*Medicago lupulina.*)

PL. XV.  
Vol. II. p. 61.





*[Faint handwritten notes at the bottom of the page]*

1844



BIRD'S FOOT TREFOIL

(*Lotus corniculatus*)









BIRDSFOOT TREFOIL  
(*Lotus corniculatus.*)

PL. XVII  
Vol. 2. p. 336





THE NEW YORK BOTANICAL GARDEN

HERBARIUM





effects of the sea air; and, as growing well on land liable to be covered with salt water, may be a valuable plant in such sorts of ground. Its leaves, from their smallness, have the appearance of the thicker and better sorts of grass. Both cattle, sheep, and horses, feed upon its leaves with much greediness, but particularly sheep, which pare it as close as possible\*. It affords much feed, which is capable of being easily collected.

*Burnet* †.—It is a plant that may be cultivated for cattle; but its principal use is for sheep pasturage. It succeeds on most sorts of soils, as those of the sandy, clayey, and peaty kinds. It is asserted to form a large proportion of the natural pasturage of extensive tracks on the most fertile parts of the South Downs; and it abounds much on most other downs of the chalky kind‡. Its most beneficial application is in the way of an early green feed for sheep, or other sorts of stock. It should be always made use of while in its more young and tender state of growth, as being better relished by the animals. In soils that are fertile and suited to its cultivation, it is said, under proper management, to sometimes afford good pasturage in the latter end of January, and through the whole of the two following months. The severe weather in winter affects it less than most other herbaceous plants, being so hardy as in some cases to vegetate in that season, when the weather is a little open. If not fed down, it may be cut at the above period as a green food for animals. Its property of resisting the effects of drought in the summer season, is likewise a circumstance of much importance in its favour. It has also the quality of getting thicker and more close on the land by time§.

For the purpose of hay it is a plant that is said to afford a large produce, but which requires to be cut rather early, to prevent its coarseness. The seed is said to be of much advantage in the feeding of horses, and also the chaffy material||.

In the culture of the plant it is of vast importance to have good seed, and that which is of the proper sort. It may be the best procured by selecting a part where the plants are good, as they afford it in a large proportion. Where the land is intended as a sheep-pasture it should be sown broadcast over the ground; but in other cases it admits of being cultivated in drills, in the same manner as lucern.

There are many other plants, both of the tare or vetch and sweet pea, as well as other sorts, that are said to have been found highly valuable, especially when kept closely fed down by cattle; but the trials that have yet been made with them are much too few to allow us to speak of them in this place.

\* Anderson's Essays, Vol. II.  
Board of Agriculture, Vol. III.

† *Poterium Sanguisorba*.

§ Annals of Agriculture, Vol. XXI.

‡ Young in Communications to the  
|| Ibid.



The different field-grasses and herbaceous plants which have been described above, may be arranged and found useful in respect to soil, allowing for particular circumstances, somewhat in the following order: for

*Clayey Soils.*—Marl or Cow Grass; Rough Cock's-Foot Grass; Crested Dog's-Tail; Meadow Fescue Grass; Meadow Fox-Tail Grass; Rough-stalked Meadow Grass; Tall Oat Grass; Trefoil; Meadow Soft Grass, or Yorkshire White; Meadow Cat's-Tail or Timothy Grass.

*Loamy Soils.*—White Clover; Ray or Rye Grass; Meadow Fescue Grass; Meadow Fox-Tail Grass; Crested Dog's-Tail Grass; Poa, or Common Meadow Grass; Meadow Soft Grass, or Yorkshire White; Meadow Cat's-Tail or Timothy Grass; Smooth-stalked Meadow Grass; Sheep's Fescue Grass; Hard Fescue Grass; Yarrow; and Lucern;

*Sandy Soils.*—White Clover; Ray or Rye Grass; Meadow Soft Grass, or Yorkshire White; Sweet-scented Vernal Grass; Sheep Fescue Grass; Yarrow; Burnet; Trefoil; Rib Grass.

*Chalky Soils.*—Yarrow; Burnet; Trefoil; White Clover; Saintfoin.

*Peaty Soils.*—White Clover; Crested Dog's-Tail Grass; Rough Cock's-Foot Grass; Rib Grass; Meadow Soft Grass, or Yorkshire White; Ray or Rye Grass; Meadow Fox-Tail Grass; Meadow Fescue Grass; Meadow Cat's-Tail or Timothy Grass.

Considerable latitude must, however, be allowed in the use of these, both on account of the variations of soil, and the differences in the states of preparation in the lands, as well as the convenience or difficulty of procuring the seeds of them.

*Early Herbage.*—In this point of view they may also stand somewhat in the following manner\*: Sweet-scented Vernal Grass; Meadow Fox-Tail Grass; Smooth-stalked Meadow Grass; Rough-stalked Meadow Grass; Tall Oat Grass; Rough Cock's-Foot Grass; Hard Fescue Grass; Burnet; Rib Grass; Ray Grass; Trefoil; Broad-leaved Clover.

*Abundant Produce.*—In this respect the following order may perhaps be proper: Ray Grass; Tall Oat Grass; Broad Clover; Burnet; Meadow Cat's-Tail Grass; Meadow Fox-Tail Grass.

Too few experiments have yet been made with regard to the differences in the feeding properties of different grasses, to afford any correct arrangement of them in that view; yet, as distension, as well as the nutrient principle, is requisite in the support and fattening of all animals, it may not be improbable but that those grasses or other plants that abound in sweet-jointed stems, and at the same time

\* Curtis's Practical Observations.



afford much foliage, may be the most nutritious. The superior utility of those grasses that run much to stem, as well as of broad clover, tares, and other similar plants, in the support of different sorts of stock, seem to countenance the supposition. And it is probably on the same principle that the first crops of hay are better capable of supporting work-horses, than those which arise from the soft laxative herbage of the aftermath.

*Grass-Seed.*—As most of the best grass-seeds may now either be purchased in the seed-shops, or be easily obtained in the manner that has been mentioned above, there will of course be much less difficulty in laying down land with proper grasses than was formerly the case.

In respect to the proportion of seed that may be the most proper and advantageous under different circumstances, it must depend in a great measure upon the nature of the soil, the situation of the land, the state of preparation to which it has been brought, and the intentions of the cultivator in its application. But old tillage lands will in general require a much larger proportion of seed than those which have been more recently broken up\*. Cold exposed situations also stand in need of a greater quantity of seed than those that are low and warm: and where the lands are designed for pasture a larger proportion than where hay is the principal object.

*Clayey Soils.*—On these some advise the following proportions as the most proper: Marl or Cow Grass, 5lbs.; Trefoil, 5lbs.; Crested Dog's-Tail Grass, 10lbs.; Meadow Fescue Grass, one bushel; Meadow Fox-Tail Grass, one bushel. And where the three last cannot be procured, Meadow Soft Grass, or Yorkshire White, two bushels; Meadow Cat's-Tail or Timothy Grass, 4 lbs.; or Meadow Cat's-Tail or Timothy Grass, 4lbs.; and Yorkshire White, one bushel†.

Others recommend, on the heavy sorts of lands that are to be broken up in a year or two, from ten to fourteen pounds of red clover; but where they are to remain in permanent grass, Marl or Cow Grass from 4lbs. to 6lbs., and White Clover 4lbs. ‡.

*Loamy Soils.*—These are supposed to require the following proportions, by some experienced cultivators: White Clover, 5lbs.; Crested Dog's-Tail, 10lbs.; Ray Grass, one peck; Meadow Fescue Grass, three pecks; Meadow Fox-Tail, three pecks; Yarrow, two pecks. Or where the second cannot be had, Ray Grass, one peck; Rib Grass, 4lbs.; and in the room of the last three, Meadow Soft Grass,

\* Sir John Sinclair in Communications to the Board, &c. Vol. III.

† Young in Communications to the Board, &c. Vol. III.

‡ Ibid.



or Yorkshire White, half a bushel; Meadow Cat's-Tail or Timothy Grass, 4lbs.; Marl or Cow Grass, 5lbs.\*;

There are others, however, that advise, on all dry soils, White Clover, 4lbs.; Marl or Cow Grass, from 4 to 6lbs.; and of Hop or Yellow Clover, from 2 to 4lbs. And for permanent pasture it is the practice of an intelligent farmer in Devonshire to sow White Clover, Marl or Cow Grass, and Hop or Yellow Clover, in the quantity of each from 6lbs. to 7lbs. with the best Ray Grass, in the proportion of one bushel. In this method a constant succession of food is supposed to be preserved for five or six months in the year; as the Hop Clover and Rye Grass flourish in the early part of the spring, the Marl or Cow Grass being in perfection in about the middle of summer, when the former begins to disappear, and the White Clover becomes in its perfect state a month or six weeks later, continuing through the rest of the season†.

On such loams as have a substratum of the stone-brash kind, it is recommended by an experienced agricultor to sow per acre: of Ray Grass, one bushel; Marl or Cow Grass, 10lbs.; White or Dutch Clover, 3lbs.; Hop Clover, or Trefoil, 1lb.‖

Without discriminating the particular kind of soil, Dr. Wilkinson, who has had much experience, recommends the use of White Clover in the proportion of 12lbs.; Broad Clover, Trefoil, and Rib Grass, of each 4lbs.

*Sandy Soils.*—On this description of land the following proportions have been found by some the most useful: White Clover, 7lbs.; Trefoil, 5lbs.; Burnet, 6lbs.; Ray Grass, one peck; Yarrow, one bushel: or instead of the last, Rib Grass, 4lbs.; Ray Grass, one peck‡.

But on the same sorts of soil other experienced agricultors only make use of White Clover and Trefoil in the proportion of 5lbs. each, with a bushel of Ray Grass, and about an equal quantity of collected grass-seeds to the statute acre§.

As grasses even in the richer sorts of lands of this nature are liable to be much injured by the moisture being too quickly conveyed away in the summer season, it would seem proper to put in a full proportion of seeds in all cases. On the poorer and thinner sorts, the quantities recommended in the above cases may often be augmented, especially in the Burnet and Ray Grass, with advantage.

*Chalky Soils.*—These are found to succeed with the following quantities: Burnet, 10lbs.; Trefoil, 5lbs.; White Clover, 5lbs.; Yarrow, one bushel; or in its place, Ray Grass, one bushel††.

\* Young in Communications to the Board, &c. † Sir John Sinclair in Ibid. ‖ Davis in Ibid.

‡ Young in Communications, &c. § Greenall in Communications to the Board, &c. Vol. III.

†† Young in Communications to the Board, &c.



On this description of soil, Mr. Boys, an intelligent cultivator of much experience, advises Rib Grass, 8lbs.; White Dutch Clover, and Marl or Cow Grass, each 4lbs.; and Yellow Trefoil, 4lbs. He also speaks highly of the use of Saintfoin in such cases. And as in this, as well as the preceding soil, the grasses are apt to be injured by the heat of the summer season, the land should constantly be well stocked with grass plants.

*Peaty Soils.*—In this sort of land the proportions of seed advised below are found to succeed well by some: White Clover, 10lbs.; Crested Dog's-Tail Grass, 10lbs.; Ray Grass, one peck; Meadow Fox-Tail Grass, two ditto; Meadow Fescue Grass, two ditto; Cat's-Tail or Timothy Grass, one ditto: or in the places of the second, fourth, and fifth, Meadow Soft Grass, or Yorkshire White, six pecks; Rib Grass, 5lbs.; Marl or Cow Grass, 4lbs.\*

An able and experienced agricultor thinks it a matter of the greatest importance, that a full quantity of seeds should be sown in all cases where the land is intended for pasturage †.

In the laying down land for the purpose of good meadows, the following proportions of these different grass seeds have been recommended per acre, for lands that are of the moister kind: Meadow Fox-Tail Grass and Meadow Fescue Grass, each two pecks and a half; Rough-stalked Meadow Grass and Smooth-stalked Meadow Grass, each a peck and a half; Crested Dog's-Tail Grass and Sweet-scented Vernal Grass, each three quarters of a peck; White or Dutch Clover, and Wild Red Clover or Broad Clover, each one peck and a quarter. Where the grounds are much inclined to moisture, the Crested Dogs'-Tail Grass and Smooth-stalked Meadow Grass may be left out. These are said to soon form a good turf; and, from their being hardy perennials of vigorous growth, are not liable to be overpowered by the coarse indigenous plants of such lands ‡.

In lands which are to be conducted under a convertible system of corn and grass, it will in most cases be the most advisable practice to sow seeds of the artificial grass kind, as Broad Clover, Saintfoin, &c., according to the nature of the soil, with those of White Clover, Ray Grass, and some others.

In cases where the lands are to be kept in a permanent state of sheep pasture, though it has been advised by some to have recourse to the finer sorts of grasses, it is probably a matter of less importance than has been commonly supposed, as the coarser sorts, when in a state of sufficiently close feeding, become gradually finer

\* Young in Communications to the Board, &c. Vol. III.

† Wilkinson in Communications to the Board, &c. Vol. III.

‡ Curtis's Practical Observations.



and better ; but in order to produce this effect in the fullest manner, they should constantly be so eaten down, as to prevent any of the seed-stems from advancing. The Tall Oat Grass, the Cock's-Foot Grass, and the Meadow Soft Grass, have, under this sort of management, become sufficiently fine, and the same effect has long been known to be produced on Rye Grass, by the close eating of it down by animals.

*Time and Method of Sowing.*—In accomplishing these different operations, different modes are practised according to the manner of preparation and the particular circumstances of the land. In respect to the first, or the periods of putting in the grass seeds; the most usual has been in the spring, at the time that the grain crops are sown: but where the ground has been brought to a suitable state of preparation by means of green or other fallows, the latter end of the summer, as about August, has been the more general season. In the former case they are commonly put in with the grain crops; but in the latter, without any other sort of crop. There has been much diversity of opinion among agricultural writers with regard to the superior utility of these different seasons of introducing the seeds, as well as with regard to their being sown with or without other sorts of crops. The advantages of the autumnal over those of the vernal sowings are contended to be: those of the grass plants being less exposed to danger from the shade, closeness, and choking that must necessarily occur at the latter season; there being less risk of stocking the ground with noxious weeds in case of the seeds of hay chambers being indiscriminately sown\*; their being put in upon a better preparation and more mellow and fertile state of the land; their growth being more strong and vigorous from their not being robbed of their proper nourishment by other exhausting crops, and the great superiority of the hay produce: while on the contrary it is maintained in support of the vernal sowings, that besides their being less precarious, shade is necessary in the early growth of the grass plants to protect them from the effects of heat; the moisture is better preserved in the soil for their support; small annual weeds more effectually prevented from rising to injure them; and the loss the farmer must sustain from the want of the grain crop guarded against†.

\* Close, in *Communications to the Board, &c.* Vol. III. It is remarked by this author, that "sowing rubbish in August is not of so great importance as in the spring. In the former season all the annual seeds vegetate, and if the beginning of the winter be mild, they will blossom; but they cannot perfect their seed, and the first frost destroys them. If sown in the spring they vegetate, blossom, perfect and shed their seeds, and thus stock the land with noxious weeds. The facts he has stated must, he says, do away the objections to sowing rubbish. It is immaterial, he thinks, what you sow, if you do but obtain an abundant crop, and leave your land clean and in good order."

† Anderson's *Essays*, Vol. I.



But though some of the arguments urged on both sides of this contraverted point may be objected to, the autumnal sowings not preventing the perennial weeds from rising and shedding their seeds in the following summer, nor the great closeness of grain crops being without injury to the growth of the young grass plants; there are facts that render it not improbable but that each method may have advantages under particular circumstances. In the more southern districts, where the severity of the winter season is later in its approach, the autumnal season may frequently be made use of with advantage, after fallow crops, for sowing grass seeds, especially in cases where the lands are in too rich a condition for the successful growth of corn. But in the more northern parts of the kingdom, and exposed situations, where the frosts set in at an early period, it may be in general the most advisable practice to put the seeds in, in the vernal months, with suitable crops of the grain kind. An intelligent writer of much experience has indeed observed, that grass seeds answer almost equally well in either method: he prefers the August sowing without corn, though the success of his trials in the different seasons has not justified any decisive conclusion\*. It is even admitted that in moory and mountainous situations, where the snows come early, autumnal sowings are not advisable, or to be performed later than the very early part of August; the vernal season with oats for being cut young for foiling, or hay, is constantly to be preferred. Mr. Dalton, in Yorkshire, after trying other methods, recommends the autumn without corn as the most advisable. And the Reverend Mr. Close states that "a friend of his, wishing to procure a good meadow or pasture around his house, fallowed the land for barley; but the spring proving wet, and the soil being a strong loam, he could only put half of it in order for that crop, which was sown, and laid with clover and rye grass. The other part was fallowed, and sown in August with the sweepings of hay chambers. The barley was a good crop, and the clover and rye grass were probably equal to the first year's cut of hay. The second year the artificial grasses began to fail; worse the third, fourth, and fifth: the sixth year, after having received two dressings, the spontaneous product of the soil began to give a fleece over the surface of the land. About ten years after these lands were sown Mr. Close saw this field, when the part sown in August was worth at least fifteen shillings per acre more than the part which had been sown with artificial grasses in the barley. Thus from actual experiments, numbers of which he could adduce, he concludes that sowing the sweepings of hay chambers in August is preferable

\* Rev. Mr. Young in Communications to the Board, &c. Vol. III.



to sowing artificial grasses in the spring with any crop of corn. Suppose, says he, the corn worth five pounds per acre, the difference in the produce of hay or seed in the second, third, fourth, and fifth years, would more than counterbalance this; and the proprietor would find a permanent improvement in his land of from fifteen shillings to twenty shillings per acre."

On comparative experiments being made with corn in the spring months, and without it in August, the latter was found by much the best mode by different cultivators\*.

But in the experiment of an accurate agricultor, mentioned by the Rev. Mr. Young †, in comparing different methods of vernal sowings, in which four acres were sown with seeds alone, on pease and buck-wheat ploughed in the preceding autumn; five acres with barley; and five more with the seeds put in alone without corn or manure: the portions sown alone were overrun with weeds, and only preserved from being smothered and destroyed by being eaten down by a dairy of cows.

Others, after repeatedly trying the experiment of sowing in the spring with corn, and the autumn without, and from long and extensive practice, conclude, "that, even if we were to have no regard to any other circumstance except the grass crop alone, it would always be best to sow it with some kind of grain; but when we consider likewise the loss that the farmer thus sustains for want of a crop of grain, the practice of sowing alone must be looked upon as highly pernicious to the farmer ‡."

It is probably in this last respect that the greatest disadvantage of the practice consists, as without it the farmer can derive no immediate recompense for his great expense of tillage and preparation of the land.

Where the vernal sowing with other sorts of crops is had recourse to, barley is that which is the most usually recommended, and "there seems to be no question that barley is in general the fittest grain to be sown with grass-seeds. The same tilth which answers for the one is requisite for the other. Barley has a disposition to loosen the texture of the ground in which it grows; a circumstance highly favourable to the vegetation of grass-seeds, which require a free and open soil to extend their roots in; the tender and delicate fibres of which have much difficulty in contending with the resistance of a stubborn soil. And this points out the reason why grass-seeds so frequently fail on strong land not in a proper state of cultivation.

\* Mr. Lyester in Lincolnshire, and M. Burgoyne, Esq. in *Annals of Agriculture*, Vol. XIX.

† Mr. Dixon of Belford.

‡ *Anderson's Essays*, Vol. I.



In the choice of barley, that sort should be preferred which runs least to straw and which is the soonest ripe \*.” But as from the grassy nature of the stem, and the large size of the ear in this sort of grain, a considerable degree of closeness and shade must constantly be kept up, it should never be sown so thickly as in other cases where there are no grass-seeds. Some object to sowing grass-seeds with barley on other principles—as those of its drawing its nourishment from the surface, which is also the case with the grass-plants, and that in consequence they must be greatly retarded in their growth from the want of due support †. Where the land is in a proper state of preparation and tillage, if sown with oats, they will be apt to become so luxuriant as to greatly injure, if not wholly destroy, the young grass-plants by the closeness of their shade ‡. In some cases they, however, succeed tolerably with this sort of crop. On the stronger kinds of land the sowing of grass-seeds has been found to answer well with thin crops of beans. In an experiment of this kind, Mr. Dalton found that the beans did not “rob, but sheltered and nourished” the grass-plants, the plan answering beyond his expectations.

The importance of having the surface mould in a fine state in order to the more regular distribution and more perfect vegetation of the grass-seeds, has been already noticed. But to effect these purposes in the most complete manner, the seedsmen should be accustomed to the business, and the seeds, as being of different weights, as little mixed with each other as possible. It is much better to have more casts than to blend the seeds together for the sake of dispatch. For all the smaller sorts of seeds, it has been suggested as preferable to deliver them by means of the Norfolk turnip trough, which has lately been adapted to clover and ray grass §. This operation should always be performed as soon after the land has been ploughed as possible, as under such circumstances the seeds vegetate in a much more quick and vigorous manner. But it should never be attempted in such a wet state of the land as produces any great degree of tenacity or adhesiveness in the mould, as in such circumstances the seeds would be apt to come up in a tufty unequal manner. Nor for the same reason should the lighter sorts of grass-seeds ever be sown in windy weather; as the delivering them in an equal and regular manner is a point of consequence to the forming of good grass-land. In the covering in of the seeds, care should be taken that none are left in an exposed state on the surface of the ground, as when that is the case many of them will be de-

\* Cartwright in *Communications to the Board*, &c. Vol. III.

† Dalton in *Ibid.*

‡ Close in *Ibid.*

§ Young in *Ibid.*



stroyed or picked up by birds, and the sward appear patchy. This business is executed in the most complete manner by a pair of light short-tined harrows at one tining. The practice of employing bush harrows is improper, as in that way the seeds are liable to be drawn into lumps. In all the lighter and more spongy descriptions of land, it may be advantageous to pass a light roller over the surface immediately after the seeds have been well harrowed in.

In cases where the tenants and not the proprietors of the lands are to lay them down to grass, it may be the most advisable practice for the latter to procure the seeds; but at the expense of the former; especially where they have a sufficient interest in such lands,—as, without this precaution, from their general propensity to keep the grounds under the plough, and their indifference in respect to the obtaining of the most proper sorts of seeds, there may be danger of the business being improperly performed\*.

*After-management of new Grass Lands.*—This is a matter of considerable importance, and upon which much of the success of forming good grass land depends.

As soon as the crop with which the seeds have been sown has been removed, it is advised by some to have recourse to rolling the land with a moderately heavy roller, when it is in such a state of dryness as just to admit the impression of the implement†; as by this means, from the mould being pressed closely about the roots of the plants, their early growth may be much benefited, and the danger of drought prevented. The practice is, however, the most necessary in the more light and porous descriptions of land. Others likewise recommend the application of manure at this period, in order to promote the growth and support of the young grass-plants‡; but this would seem quite unnecessary when the mode of preparation that has been just described has been attended to.

As the surface of such grounds as have been newly laid down to the state of sward is, from the previous tillage which they require, extremely tender, and readily broken into holes for some time even in the drier descriptions of land, the turning in of cattle with the view of feeding them down must in most cases be highly prejudicial by the treading which they cause. The best practice is therefore probably to suffer no sort of stock to be put upon such lands till the spring after their being laid down§; or where the farmer finds it absolutely necessary to turn upon the lands, the lightest sort of stock should constantly be selected for the pur-

\* Communications to the Board of Agriculture, var. loc. Vol. III.

† Cartwright and Maxwell in Ibid.

‡ Wilkinson in Ibid.

§ Maxwell in Ibid.



pose. It has been observed that the advantage of feeding such lands during the autumn and winter seasons is scarcely a matter of any consequence, as the spring feed for sheep, where it is omitted, is of so much greater utility, a very early pasturage being in this way afforded for ewes and lambs\*.

As to the advantages in the succeeding management that may be had recourse to, in different cases and circumstances, there is much contradiction in the opinions of different experienced cultivators, some maintaining the superiority of keeping the ground closely fed down by sheep or neat cattle, while others conceive mowing or feeding as preferable. There seems little reason to doubt but that feeding by some sort of stock is a much better practice than those of either mowing or feeding; the chief difficulty is in respect to the sort of stock that is the most proper. On the more dry and firm sorts of ground a mixed stock may be the most advantageous, as neat cattle and sheep, as in that way the new pasture may be fed down in the most regular manner; but on those that are of a more open, porous, and less firm quality, sheep, by their eating so closely, may do much harm, especially in the first years of the new lay, by pulling up the young and imperfectly established grass-plants. Several instances of this kind we have noticed in such soils. In lands that are more inclined to moisture, the consuming of the produce by neat cattle must constantly be liable to do mischief, except in very dry seasons; they must of course be principally fed down by sheep. And in all cases where the new lay is chiefly constituted of the more coarse sort of grasses, sheep would seem to be the most proper kind of stock, as the grasses are thereby constantly becoming more fine and sweet. Many facts of this nature have been noticed by cultivators. The sweetness of the pasturage on many sheep downs has been remarked to depend more on their being kept close fed down than any other circumstance, as on being neglected in this respect it becomes coarse, and is rejected†. It has been well observed, indeed, that “sheep-feeding not only ameliorates by enriching the soil, and fining the herbage, but also by destroying weeds‡.” We have been assured by a very extensive and experienced cultivator in Somersetshire, that under this sort of management, not only many coarse grasses but other sorts of plants become fine, and eagerly fed upon by animals.

Doctor Wilkinson, who has been much in the habit of comparing different practices, advises the grazing constantly with sheep, and for the first six years never to

\* Young in Communications to the Board, &c. † Agricultural Reports of Wiltshire and Stirlingshire.

‡ Young in Communications to the Board, &c. Vol. III.



permit the scythe to touch the lays. And the Reverend Mr. Young has well observed, that it is not merely the first year that feeding with sheep is the best practice on new lays, but it may be so managed the second, and if it extend to the third it is the better: and though there is not any necessity for adhering to it any longer, it has been found to answer well in his practice, four, five, or even six years; and in general he thinks it may be concluded, that the more the land is fed with sheep, the greater the improvement will be. But in this management the impoverishing absurd system of removing the animals to be folded in other places, is not to be had recourse to.

It has been long the practice in many districts with the most improved cultivators, to have recourse to the method of sheep-feeding for some time after laying the lands down to grass, as two years or more\*. And where ray grass and white clover are intended to remain some years, it is found, by some, advantageous to eat them the first year by sheep, in closing, thickening, and rendering them more permanent†. These facts are all in evidence of the great propriety and utility of the practice of feeding new grass lands. It must however be observed, that in order to render the practice as safe and beneficial as possible, the new lays should not be fed during the autumn, or the stock turned into them at too early a period in the spring. Nor should they be too heavily stocked, or the stock kept in the pastures too long, especially when it consists principally of sheep, as they may do much harm by paring and eating the plants so closely down, as immediately to kill them, or expose their roots too much to the destructive effects of drought. And in cases where the grasses have run up much to stem, if the lands be sufficiently stocked with plants, it may be an useful method to cut them over by means of a strong scythe before their seeds are formed, as by this means they will become more strong and vigorous: but, in the contrary circumstances, they are better left for the purpose of providing a more abundant supply of young grasses, as the benefit obtained in this way will more than counterbalance the injury sustained by the running up of the old plants.

But though the practice of feeding new laid grasses in the first years appears to be the most advantageous and proper mode of management, especially for lands intended for pasture, there are many cases in which they may be mown with great success. This practice is perhaps always the most beneficial and proper, and indeed the only one that can be safely adopted in such soils as possess any great de-

\* Corrected Agricultural Report of the North Riding of Yorkshire.

† Corrected Report of Perthshire.



gree of moisture, as under such circumstances the feeding them down with any sort of live stock must in most seasons be injurious to the sward. And, besides, where the object and intention of the farmer is chiefly hay, the grass-plants, by being kept closely eaten down by live stock for a considerable length of time before the scythe is applied, may, from their becoming thereby disposed to a low and lateral spreading growth, be afterwards more unfit for the production of hay crops. Several facts of this nature are related by writers on husbandry. In one case, where different divisions of land of the same kind were laid down in the same manner, on one of them being kept in the state of pasture and the other alternately mown and pastured, after some years both being shut up for hay, that which had been pastured afforded a much inferior produce to the other\*. The same thing has happened in other cases of old pastures being converted to hay lands, even when the most favourable season prevailed †.

On these principles it may be a more judicious practice to manage lands designed for hay without having them for any great length of time, previously to their being mown, fed down closely with stock, as in this way a larger produce of hay may be afforded.

Where the new lays are mown the first year after being laid down, which is not a method to be generally recommended, it is an excellent practice to apply a moderate coat of manure over them in the autumn, especially when the state of the land and the season is such, in respect to dryness, as to admit of its being done without injuring the surface sward; as by this means the grass-plants not only become more strong and vigorous, but better established in the soil, and of course bear cutting with much less injury.

As it may sometimes happen, though it can be but seldom, where the methods that have been detailed above are fully attended to, that the cultivator may fail either in part or wholly of producing a good lay: in the first case it is the best practice to have recourse to sowing fresh seeds, which should be performed in the early part of the spring, when the weather is in a moist state, the seeds being advised by some to be trodden in by putting sheep upon the land either indiscriminately, or by very open folding, as the use of the roller will not be effectual, and that of harrowing cannot be practised without injury‡. Doctor Wilkinson has found advantage from putting the seeds in before the manure was applied in the new

\* Wight's System of Husbandry, Vol. IV.

† Young in Communications to the Board of Agriculture, Vol. III.

‡ Ibid.



lays, which are sometimes too hastily ploughed up. By either method the sward of such lays may often be much thickened and improved.

And in cases where the grasses have run up much to stem, if the lands be sufficiently stocked with plants, it may be an useful practice to cut them over by means of a sharp scythe before their seeds are formed, as by this means they will be more strong and vigorous and the lands be less injured; but in the contrary circumstances they are better left for the purpose of providing a more abundant supply of young grasses, as the benefit obtained in this way will more than counter-balance the injury sustained by the old plants.

Where there is a complete failure from particular causes, the most adviseable practice is, in cases where the seeds have been put in in the spring with grain crops, to take off these crops as soon as they will admit of it; and after giving the land one ploughing, directly to harrow in fresh seeds. The business should be accomplished as early in the beginning of August as possible. A roller may be applied over the land when in a suitably dry condition about October. But where the latter end of summer has been the period of sowing, it is recommended that the land should have three ploughings performed upon it in the early spring months, when the weather is sufficiently dry, and the grass-seeds be again put in with a crop of buck wheat in May, which, though it is not a suitable crop for the heavy wet sorts of land, sometimes answers well in dry seasons; and in wet ones, as affording but little feed, may be mown when in blossom as a green food for cows. From its not robbing the land much of its fertility, it is well adapted for the above purpose\*.

In regard to the application of manure to new laid down grass lands, though it will seldom be absolutely requisite, where they have been returned to the state of sward under the degree of fertility and preparation that has been already advised, it may in most cases be had recourse to with great advantage and improvement, as it is probably one of the best means of preserving a good close state of sward when judiciously employed. It has been remarked by an experienced cultivator, that though in general no manure will be wanted till the land has been mown for hay, there can be little doubt but that great additional improvement will be produced where manure of any sort can be applied, and that "the oftener the land is manured, the greater will be the improvement†."

If the lands have been laid to grass with corn crops, the application of a slight dressing of manure in the autumn following may, as has been already seen, be of great utility in fixing and encouraging the growth of the young grass-plants; but

\* Young in Communications to the Board of Agriculture, Vol. III.

† Maxwell in Ibid.



in other cases the latter end of the summer following, or very early in the autumn, are supposed by some to be the most beneficial periods for the purpose; but as at these times, in many instances, much loss of manure may be sustained both by evaporation, and the washing of heavy rains and snows, it may be a better and more advisable practice to perform the business in the early spring months, especially where the lands are to be conducted under the scythe, as in this way the enriching material will be ready to exert its influence at the moment the young plants begin to send forth their new shoots; and thus not only afford more assistance in thickening and invigorating the new sward, but be less in danger of being uselessly dissipated and wasted\*.

But where manure cannot be spared for repeatedly dressing new grass lands, as the grasses are often, especially on lands not well suited to their growth, liable to decline and become thin, in some instances it is supposed from the sown grasses disappearing before the spontaneous ones have attained sufficient vigour and strength†, but more generally, probably, from the grounds not having been in a proper state of fertility or fineness of surface mould at the time the seeds were put in, or the particular unfavourableness of the season, about the close of the third summer after their being sown, it is believed to be a better practice to defer the use of manure till that time on such lays as are pastured; and when they are under the scythe, till the hay crop has been taken from the ground‡. We have no doubt of the success of the application of dung top-dressings at these periods, though they must evidently be made use of in a less economical manner than at a later season in the autumn, or an earlier one in the spring. And it is the most common opinion that all the finer and more soluble kinds of top-dressings are applied with the greatest benefits in the very early spring months, as about the latter end of February, or the beginning of the following month. The differences in the effects of these sorts of manure have, perhaps, not yet been fully ascertained.

In encouraging and supporting the growth of the natural grasses when the sown ones decline about the third year an experienced cultivator§, who seems to favour the opinion of manure being the most usefully laid on land early in the autumn, or on hay lands immediately after the crops have been taken off, states that he has “used coal ashes with great success, to the amount of three chaldrons per acre. He has laid of this manure on grass land above 50 chaldrons in a year. About eight years ago he laid down a field of 12 acres with broad clover principally,

\* Section on Manures. † Wilkinson in Communications to the Board, &c. Vol. III.

‡ Young in Ibid. § Dr. Wilkinson of Enfield.



intending it to stand only for two years. In the summer it was mown twice, next year it was grazed: the clover was but weak. As he had particular reasons for altering his mind, and for wishing to continue it in grass, he resolved to try the effects of grazing it with sheep. On the fourth year it looked so very bad, the clover almost entirely disappearing, that he was tempted to plough it up. He, however, resolved to continue the grazing, and to give it a dressing of three chaldrons per acre of coal-ashes. The next year he observed the white clover and natural grasses beginning to form a close turf, and the field is now an excellent piece of sward, without the aid of any hay-seeds."

It would appear from the further trials of the same intelligent agricultor, that the following substances have much effect, not only in promoting the growth and rendering the herbage more fine and sweet, but in renovating the sward.—"The scrapings of the road, or sand-drift, are, he says, of great service in producing a sweet herbage. Wherever the sweepings of his own walks have been laid on an adjoining common, he has observed the coarse grass disappearing, and the fine bents showing themselves. He has a field now in his own occupation which, from a piece of coarse herbage, has been brought into such a luxuriant state of sward that it is esteemed the best piece of grass land in the parish. The improvement was in part owing to its situation near a brook, which brought down from a contiguous common a quantity of leaves and sand-drift: these were carefully collected and laid on the meadow every year."

And he has used fold-yard liquor with advantage.—"Having laid down a field to grass immediately adjoining his fold-yard, which was situated above it, by means of pipes and trenches he had the liquor from the fold-yard conducted over the field, after having collected it in a reservoir: the effect of it in destroying coarse grass, and producing a sweeter sward, was very remarkable."

The effects of watering have likewise been found powerful in the reproduction of sward; "and where it can be had at command, land may with great facility be broken up for corn, and afterwards returned to a state of meadow. In two different meadows, which during the winter were frequently flooded, he has pared off part of the turf, and has observed that the ground became green the first year, and on the second it was so covered with grass that he could with difficulty distinguish where the sward had been taken off. He has known the same land pared a second time in three years, and speedily covered again with a coat of sward after having been frequently flooded."

The effects of the following manures, according to the experience of the same cul-



tivator, would seem to be chiefly in promoting the luxuriance of the grasses, and of course to be principally advantageous in respect to the quantity of produce. "Tallow-chandler's graves on being used to the amount of a ton an acre, at half-a-crown a hundred weight, the grass was rendered so rank that for some time cattle would not touch it, and the hay was too coarse for sale. On account of its rankness he generally uses it mixed with mould or ditch earth. Its effects are visible for some years after it has been laid on in the superior verdure of the grass."

It is observed, that the effects of "night soil have been abundantly proved both in Flanders and the neighbourhood of London. The quantity used on grass land is about three loads an acre. It is a stronger and more permanent manure than common dung."

In the fixing, producing, and rendering the white clover more permanent, the following substances have been found by the same gentleman to have considerable powers. On "the application of marl he mentions one fact, which is, that he has known it successful in fixing the white clover on strong cold land, from which it is very apt to disappear. He has likewise found folding of great advantage in fixing and forwarding the white clover. Coal-ashes, will, he says, produce this clover on wet land; but unless the land is drained it will soon grow weak or disappear." It has also been observed, that on the drier clayey lands in Cornwall, "sea sand is found to mellow the clay and make them hold the grasses." And on what are often termed stone brash lands the use of marl is found of great utility, when applied in the latter part of the summer of the first year of the lay. But it is necessary, to the success of this sort of application, that the ground be well covered with grass before it is applied, as where the surface is much exposed, the marl is liable to plaster and cake together, and the young grass-plants to be in consequence exposed to much injury from the heat of the summer. This substance seems to bring up the best sort of natural grasses. In time this is, however, sunk below the reach of vegetation. About thirty cart loads are sufficient for the acre. And chalk on the deep loamy clays is found an useful application the first year on new lays, in the proportion of about twenty loads to the acre\*. And on the more sandy descriptions of land clayey marl may be of great advantage in establishing the grass. On peaty or moory lands marl and other similar materials will be of advantage in rendering them more compact, and better suited for preserving the grasses; and sand and road stuff for fining the herbage.

The advantages from the two following substances do not seem so important.

\* Davis in Communications to the Board, &c. Vol. III.



Soot has been much used as a top-dressing, but Dr. Wilkinfon has not observed "the effects to last beyond the first year. He has tried it to the amount of sixty bushels per acre, at 8d. per bushel; perhaps it should be used in larger quantity. Lime is nearly as dear, and of that he has used 160 bushels per acre on arable land. If he uses soot again he intends to lay it on to that amount. But he has used sugar-baker's scum with great success to the amount of two loads an acre, at half a guinea per load, which has been found a strong warm manure, highly serviceable on cold land, its effects being permanent." Lime is found useful on the more friable red loamy soils, by fixing and rendering them more close, to keep the vegetation more to the surface, as well as to promote the growth of the natural grasses, and prevent their roots from being injured by the heat of the sun.

The following materials are probably chiefly useful in protecting and nourishing the young grass plants in their more tender growth; but they are more slow in producing their beneficial effects,—“Woollen rags, though not generally used as manure on grass land yet, when chopped small, have been spread with advantage on young clovers before winter to the amount of about 10 cwt. per acre\*.”

On applying, in order to compensate for an immediate crop of hay, and to thicken the sward, on one part of a field rotten dung about eight tons to the statute acre, on another part woollen rags chopped at the rate of 100 stones to an acre; and on a third a rich marl in the proportion of about 80 tons to the statute acre: Dr. Campbel, on comparing their effects two years after their application, found that “the dung had produced the greater luxuriance. The woollen rags had a superior verdure, a deeper green: but as they had not yet been properly incorporated with the land, by the grass growing over them, their ultimate produce could not be ascertained. An acre of land may, he says, be manured by this means for about 3l. effectually, should they be found to answer the purpose.” The same is the case with “the marl, which having covered the ground into which it is not yet carried down by the rains, and the grass not having grown through, it has at present rather done harm than good.” On this account it is supposed that marl is long in producing its beneficial effects, and the return of which cannot be looked for in less than two or three years.

These facts sufficiently show that different effects may be produced on grass lands by the application of different sorts of substances to them in the manner of top-dressings after they have been laid down. That where fine herbage is the principal object in view, coal ashes and composts of the earthy kind, formed from sand, mud,

\* Wilkinfon in Communications to the Board, &c. Vol. III.



scrapings of roads, and other similar materials, intimately blended and incorporated with suitable proportions of well rotted dung, may be the most advantageous applications. The liquor of fold-yards and watering may also be useful in the same intention, as well as those of restoring the swards, and promoting the luxuriance of the crops. But where the increase of produce is chiefly intended, good dung in a well reduced state, tallow-chandler's graves, night soil, chopped rags, foot, scum of sugar, and other manures of the more animal kind, are the most beneficial and proper. In other views, as those of establishing and preserving the different grasses—marl, lime, chalk, the folding of sheep, and other substances and operations of the same nature will be the most suitable for producing such effects. And in rendering the lands more firm and solid, the last three substances may probably be had recourse to with the greatest benefit and success.

*Artificial Grasses.*—The methods that seem the most advantageous in restoring different sorts of tillage lands to the state of grass, as well as those which appear the most proper for afterwards bringing them into the most perfect state of sward and productiveness, having been thus explained, it may be necessary to describe the modes of culture that are best suited to the raising crops of the artificial grass kind, and the means of consuming them with the greatest chance of profit and advantage.

The general introduction and interposition of crops of artificial or sown grasses between those of the corn kind is a practice of the greatest utility and importance, as the lands are thereby not only prevented from being so much exhausted as would otherwise be the case, and at the same time rendered fit for the growth of particular kinds of grain without the necessity of fallowing, but a much larger proportion of green and other food than could otherwise be obtained is provided for the support of live stock. It has of course chiefly laid the foundation of the late improvements in arable cultivation as well as live stock.

As most of the plants employed in this way are of considerable size and strength, or luxuriance of growth, they must of course, as well as the natural grasses, require the ground on which they are cultivated to possess a good state of fertility, and a considerable fineness of mould, as where this is not the case they seldom succeed in a perfect manner, or afford that abundance of produce which would otherwise be the case. Like the natural grasses they should also be adapted to the peculiarity of the soil on which they are to be grown, as they are all found to answer better on some kinds of land than others. Some of them succeeding most perfectly on the heavier sorts of soil, as those of the more dry, loamy, clayey, and stronger gravelly descriptions; others on the more strong, poor, and thin kinds of



calcareous lands, as those of the chalky and limestone forts, and others on the deep fertile grounds which abound in vegetable matter.

*Red Clover*\*.—This is a plant which is well known, and that rises to considerable height, with a rather strong stem, affording a large produce of leaf and blossom, on which account the land is kept in a more perfect state of closeness and shade, while the crop remains upon it, than is the case with most other plants of the artificial grass kind. On this principle it has of course much more influence in ameliorating and improving the soils, and affords a better preparation for wheat crops †.

Red Clover is capable of being cultivated with success and advantage on almost all the more heavy and dry descriptions of land which are in a tolerable state of fertility, and it is said to succeed on the deeper kinds of gravelly, chalky, and sandy soils ‡.

In respect to preparation it is less nice than many other herbaceous plants, yet the finer the state of mould the land has been brought into, the more certainly and the better it succeeds. And as wheat is the grain crop that mostly follows clover, it may in general be the most advantageous practice to apply manure for the crop with which it is grown, as by that means the ground will be in the most suitable condition for that crop. It may be sown with any clean grain crop, but is found to succeed the best with barley after turnips §, where the nature of the soil will admit, as the land in that way is brought into the best state of preparation for its reception.

*Seed*.—It is of much consequence in the raising of crops of this sort to sow such seed as is perfectly good, fresh, and well ripened; as from its being kept in the shops for a considerable length of time much of it is frequently in a state unfit for vegetating. That which is good has a bright appearance, slides easily in the hand, smells sweet and has the purple coloured seeds greatly prevailing over those of a yellow cast.

The proportion of seed that is necessary must vary according to the quality of the land, the state of preparation to which it has been reduced, and that of its fertility; as in rich lands almost every seed grows, while in those of the contrary description many of them fail in producing plants, especially in dry seasons, and a great number of the plants are apt to die away after they have come up. It seems not improbable but that both these inconveniences might in a great measure be removed by having recourse to steeping the seed in some liquid for a short time in such seasons, before it is sown on such sorts of land, as by this means it will be made to vegetate in a more quick, regular, and vigorous manner, without remaining in the soil in an inactive state till it becomes unfit for producing healthy plants.

On the richer sorts of soil that are clean from weeds, ten or twelve pounds may be

\* *Trifolium pratense*.

† Marshall's Rural Economy of the Southern Counties, Vol. I.

‡ Synopsis of Husbandry.

§ Kent's Hints.











RED CLOVER.  
(*Trifolium pratense.*)

PL. XVIII  
Vol. 2. p. 836





11-11-17 1839  
1839





a sufficient quantity for the acre, while sixteen or eighteen pounds will not be too much for those that are of a more stiff quality, and possess a less degree of fertility. Where the land is to be converted to the purpose of pasturage for two or more years, it may also be advantageous to sow a larger proportion of seed than where it is to be broken up in the following season. And where it is to be cut for hay it is better to be sown rather thin, as the plants will be in less danger of being drawn up weak\*.

*Time and Method of Sowing.*—It may be put into the ground in any of the more early spring months with crops of spring corn, or sown over the young wheat crops at the same season. When it is sown with oats the most common time of putting it in is about the beginning of March; but with barley it is performed at a later period, as in April. It may therefore, perhaps, be more properly sown with this crop than oats in the later districts, where it might be apt to suffer from the frosts in the preceding months. On the richer soils, as from the luxuriance of its growth too much of it is frequently cut with the barley, so as to keep it in the field so long as to expose it to danger, especially in bad seasons, or from the barley becoming rank and lodging, great injury may be done to the clover, it may be more advisable to sow it with the oat, or over the wheat crops. But on the thinner soils there is seldom any danger to be apprehended in this way. In order to prevent its proving hurtful to the barley in its early growth, by the rapid progress which it makes in some cases, it has been recommended not to sow it till the barley has sprouted to the height of two or three inches, as it may then be performed to equal advantage as at an earlier period, the barley being rather benefited than injured by the slight harrowing which is necessary†. In sowing it among wheat it is the best method, especially in the southern districts, to have the business performed at as early a period in March as the land becomes sufficiently dry to admit of harrowing‡.

Clover crops may likewise be raised without being mixed with those of the grain kind. In very rich soils this may indeed often be the most advantageous practice, as the danger of either crop being injured by the other will be fully obviated. The sowing in this case should be executed as early in the spring as the state of the land and that of the season will with safety permit.

When clover is sown with grain crops on the more fertile and better prepared

\* Corrected Report of the West Riding of Yorkshire.

† Modern Agriculture, Vol. II.

‡ Report of Middlesex.



lands, with the intention of being kept in the state of pasture for some time, the grain should always be sown much thinner, or in less proportion than is usual under other circumstances, as in this way the danger of its lodging and injuring the clover plant may be avoided\*. In sowing it with barley it may according to some be put in by the drill-machine, after that crop has been sown, broadcast being immediately covered by light harrowing. The practice of drilling it in the same drills with the barley, as employed by Duckett, is less common, and by no means so good.

In putting clover in with grain crops the most common practice is to perform the business either immediately, or as soon as possible, after the grain has been covered in, as all small seeds vegetate in much the most perfect manner when put in soon after the soil has been turned up, as has been already explained.

With whatever sort of crop the clover seed is sown, it should be dispersed in as regular and even a manner as possible over the surface of the ground when in the broadcast method, after it has been rendered perfectly fine by the harrowing in of the grain crops. And in order that this may be effected in the most complete manner, it should be performed, if possible, when the mould is in such a state of dryness as to work well under the harrow. But it should on no account be executed when the soil is in such a state of moisture as to clog or stick much together†, as under such circumstances the seed will neither vegetate well or be covered in in a regular manner, being liable to be drawn into heaps by harrowing. In covering it in, a light short-tined harrow is the most adapted to the purpose, which in the freer and more mellow sorts of land should only be passed over once in a place, but in those of the stiffer and more heavy kinds twice may be necessary. The seed should never be buried to much depth, as its vegetation would by that means be much retarded. The use of the tined harrow is much preferable for this purpose to that of the bush kind, as by the latter the seed is not only less perfectly covered in, but liable to be drawn so together as to rise in tufts. And merely rolling over the land, though sometimes employed, is a practice never to be depended upon.

Where the clover is sown among the green wheat, harrowing it in with such light harrows once in a place is the best practice in all cases, except where the wheat is very thin, and the soil too loose about its roots to permit it with safety. In all the more light descriptions of land, the use of the roller after the seed has been covered by the harrow must be of great utility, as well in closing the particles of the soil

\* Synopsis of Husbandry.

† Ibid.



round the seeds as in levelling the surface, and rendering it less penetrable by drought. And even on strong soils, where the clover is sown among the wheat, it is recommended by some as of great use after harrowing\*.

There is a practice which prevails in some districts of sowing a larger space of land than can be covered in at the same time, but it is an injudicious method and should never be attempted, as clover seed always vegetates the most perfectly when it is covered in immediately after it has been sown, and it is apt to be much injured by lying exposed for some time upon the surface of the land before being harrowed in, especially if much wet should fall.

With some it is a practice when the land is intended for the purpose of early pasturage, and in some cases where the object is hay, to sow rye, rib, and other similar grasses with the clover. In the first intention the practice may be beneficial, as the rye grass rises early, and may contribute to afford a more full and better herbage for the stock at such periods, especially on the later sorts of soil†; but with the latter view it should perhaps seldom be made use of, as the clover will in general produce a sufficiently abundant crop of itself; and from other sorts of plants being mixed with it, on account of their drying in an unequal manner, it may sustain injury as hay. It is probably for some reason of this sort that such clover hay as is mixed with other grasses is less saleable, and of considerably less value in the London markets, than that which consists solely of clover‡. Some cultivators, however, suppose, that by blending rye grass with clover, in a small proportion, a strength and body is given to the crop§. It has been suggested as an improvement where rye grass is mixed with clover, to sow the latter a week or two before the other, as from the clover plants having a tender, weak stem in their early growth, they may in that way be prevented from being injured by those of the rye grass clasping round and shading them||.

If the crop be designed for cutting green for the purpose of soiling animals, it would seem to be the best method not to sow any other sort of grass with the clover, as no advantage can be gained in that way\*\*.

*After-management.*—Where the seed has been put in on a proper soil in a suitable state of preparation, little attention will be necessary to the crop afterwards. But as the young plants while in the state of seedling-leaf are liable to be attacked by slugs or other insects, in the manner of turnips, by which the plants are often greatly

\* Corrected Reports of Middlesex and Northumberland.

† Marshall's Rural Economy of the Midland Counties.

‡ Corrected Report of Middlesex.

§ Corrected Report of the West Riding of Yorkshire.

|| Corrected Report of Perthshire.

\*\* Ibid.



thinned and destroyed, the crops ought to be carefully attended to in their early growth. Many acres have sometimes been completely ruined in the course of a few nights\*. Such effects are to be prevented by putting in the crops as soon as possible, that they may become sufficiently strong and vigorous before the dry weather sets in, and by the use of such means as have been advised for turnips.

With some it is the custom to apply manure over the clover crop immediately after the grain has been taken from the land, which in soils that are not in a good state of fertility may be advantageous in preserving and invigorating the plants; but under other circumstances it is not necessary. There is, however, another case in which the use of what is termed long stable dung, when not in the state of fermentation, may be found useful, by preventing the young plants from being too closely nibbled and eaten up by sheep, which is that where the land is in the state of commonage†.

But when the clovers are to be continued for two or more years, the application of a thin coat of manure, in the autumn or spring season, is a practice from which great benefit may be derived, especially on lands that are in the less perfect state of heart. In the drier sorts of soil this business may probably be done with the greatest advantage about the latter end of February; but where the lands are soft, retentive of moisture, and poachy, the early part of the autumn, while the ground is sufficiently hard, may be the most suitable season for the purpose. Well-rotted dung is perhaps the most proper in these cases. By performing the work at this period there is less danger of the clover plants dying away in the winter than is the case under other circumstances‡. At whatever season the manure may be applied, it should be spread out over the surface in as even a manner as possible and beaten perfectly fine. It is the practice in some places to sow coal-ashes over the young clovers, in the latter end of January or the beginning of the following month, when they are intended to be mown in the following summer, in the proportion of about thirty bushels to the acre, by which means the crops are rendered more abundant and the plants better preserved§.

The methods of disposing of crops of this sort are either by mowing them for hay, cutting them occasionally as green food for different sorts of live stock, or feeding them down with cattle, sheep, and other animals.

In the first mode a large quantity of hay for the purpose of feeding working horses may be procured with but little expense or trouble. In these cases the crops

\* Corrected Report of Middlesex. † Ibid. ‡ Ibid.

§ Hertfordshire Report, and Annals of Agriculture.



should be mown as soon as most of the heads are in full blow, before they begin to turn of a brown colour and die away. The most proper time may be known by attending to the foliage on the bottom parts of the plants, as when the leaves on these begin to drop off and decay the crop should be cut as soon as possible, as by standing afterwards it will lose more in the bottom than it can gain in the top\*. The crops usually attain this state some time about the middle of June, according to the nature of the soil. Though it is supposed by some that clover takes less harm by standing, after it is in a condition for being mown, than many other sorts of plants it is always the best practice to cut it rather early, as by remaining on the ground it not only loses its heads and lower leaves and becomes reduced in quantity, but the plants are rendered hard and sticky, and so exhausted as to remain a great length of time after mowing before they send up new shoots and afford good herbage†. After it has been cut, Mr. Middleton advises that the swaths should not be spread out, as is the common practice with meadow grass, but suffered to lie in the state the scythe leaves them until they are dried about two-thirds through, which, if the season proves favourable, will be in about three days, and if the weather should then appear promising, they may be turned with rakes immediately after the dew is off. If there be no rain, the clover thus spread out will be ready to cock up the next morning, or on the fourth day, as soon as the dew is fully gone, and may be carried in as soon afterwards as is convenient. And if this be done as soon as the dew is well off, the leaves will be just sufficiently tough to preserve them whereas when this operation is omitted in the morning; and performed in the heat of the day they will be too dry, being reduced to powder, and lost in the business of heaping and loading. When, however, it is heaped sufficiently early in the morning, the loading and stacking may continue through the day. Where a part of the produce is become rather over dry, there is a method adopted by expert haymakers of putting the rows into heaps without rubbing the leaves off. It is only familiar to a few, and is performed by rolling the swaths over with rather larger forks than usual in a very gentle manner, keeping them from being separated or broken, and then laying them lightly into the cock, being careful to avoid breaking and tossing the hay about, putting it along the ground, or beating it down flat. In this mode of converting clover into hay there will not only be much less loss, but the hay be of a much better colour and

\* Corrected Report of Middlesex. † Corrected Report of Perthshire.



finer flavour; which are circumstances of great importance both in its sale and use as fodder.

Where a second crop is to be taken for the same purpose, all cattle should be kept out of the field, in order that it may be in full blossom and ready for the scythe about the last week in August. It must be made into hay in the same manner as the first, and should not be delayed later, on account of its losing in weight, and the danger of not getting it into the stack before the heavy dews and rains set in. Besides, by getting the hay off as early as possible, there will be more sheep-feed previous to ploughing the land up in the autumn for wheat. The quantity of produce in the second crop is in general considerably less than in the first, and not by any means so good in quality: consequently, if hay be not much wanted, it is a better practice to feed it, especially where the soil is sufficiently dry, than make it into hay.

The quantity of produce in the first crop varies considerably; showery summers producing great crops, while in dry ones they are often stunted to one half. Besides, the natural quality of the soil has a considerable effect, as well as its being in a high or poor state of cultivation. On the general average of years and soils in Middlesex, the two cuttings are said to produce about three loads of marketable hay; which, for the last fifteen or twenty years, are supposed to have yielded twelve guineas per acre. In many cases a much larger profit is afforded. By some, two tons are supposed to be a medium crop for the first cut\*.

It is mostly employed for the support of draught-horses, as it is the general opinion that it is more nourishing than any other hay, except that of sainfoin. It, of course, sells at about fifteen shillings a ton higher than hay of the meadow kind. It is also found highly useful in fattening oxen and in feeding milch cows; but is less esteemed for saddle horses, probably from its not having been so much in use, as it would seem well calculated for the purpose.

It is sometimes a profitable practice to let the crop stand for seed. In this case, the method is either to eat it well down in the early part of the spring, till about the latter end of May, by ewes and lambs, or other sorts of stock, or to let it stand for a first crop of hay, and depend upon the second crop for seed. The first appears, however, by much the best practice, as the land is less exhausted, consequently in a better state for the succeeding crop; and, at the same time, the

\* Kent's Hints.



farmer has the great advantage of an early green-feed for his stock in the spring months. And it seems not improbable but that seed of a better quality may thus be obtained in a greater abundance, as the plants by being mown must be rendered more weak and less proper for affording good feed; while, by feeding down, they will not only suffer less in this respect, but throw out more flowering-stems, and, of course, afford a larger proportion of seed. Where the latter method is followed, the first cut should be made as early as possible. It is always necessary to take off the first growth in one of these ways, as the clover plant does not perfect its seed early in the summer.

The crop thus reserved for seed must be suffered to remain till the husks, or blossoms, become perfectly brown, and the seeds have acquired a considerable degree of firmness. It should then be cut, and harvested in the same method as the common crop, but let remain in the field till it is more perfectly dry and crisp, in order that the seeds may become more fully hardened. It may then be laid up dry, in order to the seed being threshed out in the winter season at the farmer's convenience.

As the great difficulty in the securing of the clover for this purpose is that of getting the herbage sufficiently dry in the dewy and damp season at which the seed becomes ripe: it has been suggested that light bags, formed of thin cloth or fine wire, might be useful for collecting, catching, and retaining the heads which mostly rise above the herbage, by being fixed upon the handles of the scythes, as they are swept off by them, being emptied as there may be necessity; as in this way the herbage, by being left upon the ground, would be of three times the value of the musty straw afforded by seed clover, either for the purpose of being eaten off or turned down as manure. Besides, the heads by being well dried in wet weather in the house, and in dry seasons in the open air, the seed would not only be preserved with more certainty, but in a much better state in respect to the sample, and, of course, in most seasons be of much greater value\*. It appears scarcely possible, however desirable it might be, to collect the heads in this way without suffering considerable loss from their dropping down and being lost in the herbage.

Much labour and expense is necessary in separating the seed from the capsule, though, or seed-coat, especially when it is effected by threshing, as the work is seldom, from its difficult execution, performed at less than from five to six or

\* Marshall's Rural Economy of the Southern Counties.



seven shillings the bushel\*. By the use of mills or other contrivances it may, however, be rubbed out with more facility, and at a much cheaper rate.

The produce in seed, like that of hay, is liable to vary much, under different circumstances: in general it may be from about three to four or five bushels when perfectly cleaned, weighing from two to three hundred weight. The principal objections to the feeding of clover crops are those of their uncertainty, on account of the state of the season at which they become ripe, the trouble and expense of threshing out the seed, and the injury which they produce in lessening the fertility of the soil. The high value of the seed in most seasons is, however, a great inducement to the letting of clover crops stand for the purpose.

But though much advantage may be derived from the converting of clover crops into hay, and letting them remain for seed, it is probable that a still greater benefit may be produced by the practice of cutting the crops green occasionally, as they attain a sufficient growth, and conveying them when wanted to the horses or other cattle in the stables and fold-yards, in order to their being consumed in the stalls. It is contended, by an experienced agricultor, that, in this manner it will certainly support more than twice the stock it would do if fed off upon the ground where it grew; and the additional quantity of manure that will by this method be made in the stables and yards, if they are kept well littered with any sort of straw, or even rushes or fern, will fully compensate the farmer for his expense in cutting and bringing the clover into the yards †.

It is a method which experience in many parts of the kingdom has proved to be of the greatest advantage, especially where the business is not upon too extensive a scale; but in large concerns it is, perhaps, impossible to attend to it so fully as may be necessary for deriving the greatest benefit from it.

The result of an experiment stated by a writer of considerable accuracy, however, shows, that even on an extensive scale it is a practice which is attended with vast advantage ‡. In this trial seven acres of clover cut green were found to be sufficient for twenty horses, seven cows, five calves, and five pigs, for the period of seventeen weeks from the middle of May. They were fed in the stable and rick-yard, being taken twice in the day to water, and the horses had neither hay or corn §. The great superiority and utility of this practice is exhibited in a more striking point of view, by contrasting this with the consumption of the same sort of

\* *Modern Agriculture*, Vol. II. † *Kent's Hints*. ‡ *Young's Eastern Tour*, Vol. II. p. 147.

§ In calculating the value of the crop, it is remarked that the horses could not have been kept



crop in the field, by an equal number of the same kinds of stock: as, in the time five acres had been used in the former method, thirty had been consumed in the latter, and the horse part of the stock left in much worse condition.

But besides the superiority of the practice of soiling this sort of crop in the economy of food, it has the important advantage, as has been seen, of affording much larger supplies of manure, especially where the stalls and fold-yards are kept occasionally well bedded and cleaned up, as the conversion of the materials proceeds, which must be greatly expedited from the vast increase in the urinary, as well as other discharges that must of necessity take place in this mode of feeding.

The great difference between feeding clovers off on the land and consuming them in their green state in the manner just mentioned, is supposed by an able writer\* to be this: “the quick growth of this grass, after mowing, shades the ground, and prevents the sun from exhaling the moisture of the land so much as it would if fed bare: consequently it continues to spring with more vigour; and the moment one crop is off, another begins to shoot up. Whereas when cattle feed it, they frequently destroy almost as much as they eat; and, besides, bruise the necks of the roots with their feet, which prevents the clover from springing so freely as it does after a clean cut by the scythe. In hot weather, which is the common season for feeding *clover*, the flies too are generally so troublesome to the cattle, that they are continually running from hedge to hedge to brush them off; equally well for less than eight-pence a day; but as the usual price at which they are taken in at in that district is two shillings and sixpence the week, it may be better to take that as the principle of calculation.

|           |                               |              | £. | s. | d. |
|-----------|-------------------------------|--------------|----|----|----|
| 20 Horses | 17 weeks, at 2s. 6d. per week | -            | 42 | 10 | 0  |
| 7 Cows    | ditto, at 2s. 6d. per week    | -            | 14 | 17 | 6  |
| 5 Calves  | ditto, at 1s. 6d. per week    | -            | 6  | 7  | 6  |
| 5 Pigs    | ditto, at ———                 | -            | 0  | 0  | 0  |
|           |                               |              | 63 | 15 | 0  |
|           |                               | Or, per acre | 9  | 2  | 1  |

The quantity of dung raised by the above stock is supposed to be from four to five hundred loads, which is estimated at 2s. 6d. per load.

The expense in labour for cutting and conveying the food to the stack is not charged; which renders the experiment in some measure incomplete. The benefit of the practice is, however, fully established.

\* Mr. Kent.



by which it is inconceivable what injury they do to the crop. But when they are fed in stables and yards they are more in the shade; they thrive better; and, at the same time, consume the whole of what is given them without waste."

Much of the success attending this practice without doubt depends on these circumstances; but besides, the upper parts of the roots are less penetrated by moisture, and fewer of the plants of course destroyed. By proper attention to this crop a very useful and abundant green food for different sorts of live stock may be provided at an early period in the spring, especially when the winters are not very severe. It is advised by some, on the poorer sort of soils to have both the first and second crops of this plant to be eaten green upon the land by sheep and bullocks, being mown and given them to feed upon\*."

In this way the cattle thrive better from their filling themselves sooner, and having more rest; and there is no waste. But in order to derive the greatest possible advantage from the soiling with this or other crops, convenient covers, sheds, or other suitable houses are absolutely necessary.

The practice of feeding down or pasturing clover crops with live stock, though it may be advantageous in many cases, especially where sheep-husbandry forms a principal object, always requires to be conducted with care and attention, both in respect to the plants and the animals that are to be fed upon them.

From the tender nature of the clover plant it should seldom be eaten on the land by the heavier sorts of cattle, as, from the greedy manner in which they feed, many of the plants are pulled up, and others, as has been seen, greatly injured or destroyed by being bruised in their treading, especially as they protrude their young shoots. Horses are particularly objected to on this account by many †. The most appropriate sort of stock is obviously that of sheep; but where the soils are of the drier kind, the lighter sorts of stock of other descriptions may be occasionally admitted, such as calves, foals, and young beasts. And as pigs are fond of the clover plant, and thrive well upon it, they may sometimes be admitted with advantage. In the practice of lamb-suckling it is an useful application of the young clovers to turn the ewes upon them, as they afford a sort of pasturage which has much effect in increasing the flow of milk. They may likewise be applied to the fattening of sheep in April and May; and be fed by the sheep intended for turnips, in the autumn, till they are ready, with much profit‡. No sort of stock should however be kept upon crops of

\* Middlesex Report.

† Experienced Farmer, Vol. I.

‡ Middlesex Report.



clover when the land is soft, wet, or poachy. In some of the southern districts, where it is the custom to eat down the young clovers by sheep, it is indeed usual to choose a dry season for the purpose, the stock being removed in case the land becomes soft and wet\*. Where this sort of stock is employed, it may be the most safe practice not to permit the animals to continue too long upon the land; as by eating the plants too closely they may sustain much mischief.

It is conceived by some that treading the soil lightly while the lands are dry may be of great utility to the clover plants by forcing the earth to their roots, and in that way protecting and rendering them more capable of resisting the effects of frost in the winter season. It has likewise been suggested that the eating off the weak, lateral shoots, that were thrown out while under the shade of the grain crops, may be serviceable by increasing the strength of the plants, and enabling them to withstand the frosts, as well as to shoot more strongly in the spring†.

It would therefore, on the whole, appear the most beneficial method, where the pasturing of this crop either in the spring or autumn is had recourse to, not to suffer the lands to be fed upon when in a moist state, or to be too hard stocked, or with the heavier sort of animals at any time.

But in the feeding down of clovers, there is not only danger of injuring the plants, but the animals that consume them. Without proper management, cattle and other animals on being turned upon them often suffer great inconvenience, and are in danger of being destroyed by the vast distension of their stomachs which takes place. In this situation the animals are in the language of the farmer said to be *blown* or *boven*. The nature of the disease does not seem to be much investigated: but it probably arises in consequence of the large quantity of green succulent herbage being greedily devoured without due mastication, by which it undergoes an uncommon degree of fermentation in the stomach; and from this sudden decomposition, an unusual quantity of gaseous fluid is at once set at liberty, which ultimately overcomes the contractile power of the digestive organ, and the animal is destroyed. The supposition is rendered more probable from the circumstance of the affection being less apt to take place when the clovers or other similar herbage are fed upon in a dry state, as the stock in these cases are not able to consume them in so expeditious a manner or in so large a proportion.

On these principles, therefore, the practice of not suffering the cattle or other sorts of stock to feed upon them when they are wet, and there is a full bite, would

\* Marshall's Rural Economy of Southern Counties. † Ibid.



seem to be perfectly correct. The advice of not turning the animals upon the crops before the sun has dissipated the dew and moisture deposited in the night is likewise judicious, and ought to be attended to, as well as that of keeping them in motion as much as possible when first turned in. With sheep the same precautions may be necessary, if they be put upon them with the other stock in their full growth; but when they are turned in after they have in some degree been fed down, there will be little danger of their being injured. Where the clovers are eaten off as after-grass in their soft, foggy, and young state of growth, there is however great danger of the stock being hurt in this way, unless these circumstances be attended to.

Various means of removing the disease, when the animals happen to be affected, have been proposed, such as common strong salt and water; and new milk and tar in the proportion of about half an egg-shell full. This last is asserted to afford immediate relief on its reaching the stomach\*. The stabbing the animal in the flank, close to the hip-bone, with a sharp penknife, so as to avoid wounding the intestines, placing a quill in the orifice to discharge the confined air, has likewise been practised with success; but it never should be attempted by unskilful persons. The use of long flexible tubes has also afforded great relief, by being introduced down the gullet into the stomach, and in that way drawing off the distending gas. This method is probably the most safe and effectual, though troublesome in the application †. There is another remedy which we have found useful in removing this malady in its more early stage, which is that of a very strong solution of prepared *ammonia* in water. By this means the confined air is in some measure discharged from the stomach, and almost immediate relief afforded.

Whatever remedy is employed, it should be applied on the first attack of the disorder, or as soon as the animal is perceived to be uneasy, as there is never any time to be lost, the distension proceeds with such rapidity.

It is evident, from what has been said on this plant, that it must be of vast advantage to have a sufficient extent of it where much stock is to be kept, as it has been found, as pasture, to far exceed most sorts of natural grass in the support of animals ‡.

The chief disadvantage of this almost invaluable plant is that of the shortness of its continuing in the lands, especially those of the lighter and more free kinds. It is asserted by some not to last longer than two years, except on grounds that are perfectly *fresh*; and in some cases where it has been often repeated not more than

\* Modern Agriculture, Vol. II.

† Tubes for this purpose are sold in London.

‡ Modern Agriculture, Vol. II.



one\*. In some of the southern districts, it is, however, found more durable on the calcareous soils, especially where not frequently repeated on the same land, from its being better able to contend with weeds in its natural state of growth †. These facts show the necessity of keeping it as far distant as possible in the courses of cropping, especially on all the more light friable sorts of soil, and the superior advantages of cultivating it on those of the calcareous kind.

It is probable that its duration may be considerably prolonged by preventing the plants from shooting up to seed-stems as much as possible, either by keeping them cut by the scythe, or by feeding them down by stock in a moderate degree; as in these ways they will be prevented from being so soon exhausted in their roots, as happens in many other sorts of plants, as soon as they have perfected their seeds ‡. The frosty nights and hot dry days in the more early spring months, as well as the close sunny weather in the summer season, are highly prejudicial in destroying the clover plant §.

When the clovers are kept in the state of herbage more than one year, they are not by any means so proper for sowing wheat after as in other cases: it is the full smothering crops that afford the most suitable preparation for this sort of grain.

Besides the common red or broad clover, there are other kinds used in cultivation; as the *White* or *Dutch* clover, and *Cow Grass*. These, from their being more frequently employed in the laying down of lands for the purpose of permanent grass, have been described above. The first affords a fine delicate herbage, which is very agreeable to most sorts of stock. In the second it is more coarse and abundant, but still less so than the common clover; and the plant has the advantage of growing better, and of being more lasting in the poorer sorts of clayey soils.

*Trefail* ||.—This, as being an useful plant in permanent grass lands, has been already noticed; but its properties as an artificial grass may be described in this place. It is of much less growth than common clover, and much slenderer in the stem; but notwithstanding it is sometimes sown with grain crops in the manner of that crop, the proportion of seed made use of is about three pottles when cleaned from the husks, but in the contrary state two bushels are mostly employed. These may however be varied according to the circumstances of the land.

Some suppose it an advantageous practice, especially where large stocks of cattle are kept, to sow it with oats, or among the wheat crops in the spring when they are to be

\* Kent's Hints.

† Rural Economy of Southern Counties.

‡ Corrected Report of Perthshire; and Rural Economy of Southern Counties, Vol. I.

§ Synopsis of Husbandry.

|| *Medicago lupulina*.



succeeded by grain in the following season, as by this means good feed is produced in the stubbles for stock in the latter part of the summer and in autumn; and at the same time they are left free for tillage in the spring. The seed is capable of being procured at a cheap rate\*.

It is said also to afford excellent pasturage for cattle, but to be more particularly calculated for sheep, either when in mixture with clover or alone, as it is not so liable to hurt them by *blowing* or *hoving* as that grass. In the latter case it is of vast importance in the support of sheep, from its being more early than clover, and coming well in after the consumption of the turnip and rye crops before the clovers are ready †.

When it is let remain for hay it does not afford a large produce, but a sort which is highly useful as a sheep-fodder in the winter season, and less wasteful than most other kinds, and which, at the same time, is supposed by some less troublesome in the process of hay-making, though others assert that it readily mats together and becomes mouldy by wet ‡.

The seed is to be collected from the second shoot in the manner directed for clover, and the produce is in general considerable, often affording seven or eight bushels of clean seed from the acre. But on the whole it is much less valuable than common clover as an artificial grass.

*Saintfoin* §.—This is a plant which, though less generally introduced into cultivation than clover, is not less important or useful to the farmer. It is on the lighter and thinner sorts of calcareous soils, what that plant is on all those of the strong, heavy, and more deep kind; and it has the superiority of being more durable. It is equally advantageous for the purposes of hay as those of pasturage, and in the latter method has not, it is said, the dangerous property of *hoving* or *swelling* the cattle that feed upon it, as is the case with clover. Its lasting properties on poor barren soils in hilly situations, where other sorts of grassy herbage are deficient or scarcely to be procured at all, likewise render it particularly beneficial in supplying a valuable green food for different sorts of stock ||.

The soils most proper for this sort of grass are those of chalky loams, light sandy or gravelly kind, or almost any of a mixed quality, provided they be not wet, and have a rocky or hard calcareous bottom, to check the roots at the depth of a foot or fifteen inches below the surface; otherwise they are apt to exhaust themselves in running down. On this account it is improper for being sown where there is great depth of mould. It is asserted to afford a large produce even on those of the

\* Synopsis of Husbandry. † Ibid. ‡ Kent's Hints. § *Hedysarum onobrychis*. || Kent's Hints.



Nº 2608  
(Hollyhock - *Alcea rosea*)





It is not to be sown in the following season, as by this means good seed is produced. The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn.

The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn. The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn.

The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn. The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn.

The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn. The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn.

The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn. The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn.

The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn. The seed is sown in the autumn, and at the end of the year the seed is sown in the spring. The seed is sown in the autumn of being sown in the autumn.



*S<sup>r</sup> FOIN.*  
(*Hedysarum Onobrichis.*)

PL. XIX  
Vol. 2. p. 370





1892  
1893





poorest quality; and on such as are of a more rich and friable nature it is often very abundant. It is only, however, in the calcareous soils, or such as have been well impregnated with that sort of matter, that this plant succeeds in a perfect manner, or becomes durable\*.

In regard to the preparation of the ground, it cannot be made too clean or too fine before the seed is sown; of course it generally succeeds best after turnips or other similar crops which require a fine clean culture while they are growing. It often, however, answers well on lands that have not undergone so high a degree of preparation.

*Seed.*—This should be selected from the best plants, and those which are most suited to the soil of the cultivator by their durable properties†. It should always be sown fresh, as that which is old never vegetates well. The proportion of seed which is necessary must be different according to the circumstances of the land; but in the broadcast method about four bushels are probably in general the most proper quantity, as on these sorts of soil it is better to have the plants thick: some, however, think less than half the above proportion sufficient. In the drill mode three bushels are mostly employed. Seed of this sort is usually procured at from about three to five or six shillings a bushel.

*Time and Method of Sowing.*—The earlier the seeds of this grass can be put into the ground in the spring the better, as there will be the more chance of their vegetating in a perfect manner from the greater proportion of moisture in the soil; as when the business is performed at a late period, if a dry season follow, much of the seed would be prevented from growing, and the young plants that come up be more exposed to the attacks of the fly‡. The latter end of February or the beginning of the following month may answer very well in most cases. It is, however, by some cultivators sown in the autumn with the wheat crop; but the practice is not to be recommended, as there may be danger of its not growing well, or of being injured in the winter season§.

It may be put in either alone or with any of the spring corn crops, but with barley after turnips is considered the best method. Some advise its being sown with about half the quantity of barley which is usually sown for a full crop, as it may shade and keep it moist during the first summer; and at the same time not injure it from the crop being lighter, which is sometimes the case. Where the barley is drilled, the saintfoin may afterwards be put in, in the same manner, but in a contrary direction. If sown over the wheats, it should be harrowed in, and

\* Marshall's Rural Economy of Southern Counties, Vol. II. † Ibid. ‡ Synopsis of Husbandry. § Ibid.



afterwards rolled. In whatever method it is sown, as the seeds are larger than those of many other grasses, they should be covered in with more care and to a somewhat greater depth. Some advise the ploughing the seed in with a very thin or shallow furrow\*. In most cases, especially in all the more light sorts of land on which this crop is sown, the use of the roller may likewise be necessary.

It is sometimes a practice to sow a small portion of clover seed with this crop, with the idea of increasing the first year's produce; but as plants of different kinds seldom succeed well together, from there being a continual contest in their growth for an ascendancy, it is probably a better practice to increase the proportion of the seed without mixing it with that of other sorts. Mr. Marshall, however, seems to think the method beneficial in ultimately procuring a fine clean crop of saintfoin.

*After-management.*—On this being properly attended to, a great deal of the success in the culture of this plant depends. The most experienced cultivators of the grass advise its being cut for hay instead of being pastured. But others think it more advantageous neither to cut nor pasture it in the autumn of the first year. It is probable that both practices may be proper under different circumstances, as in the richer sorts of soil, where this plant mostly affords a tolerable crop when sown alone the first year, it may be mown with propriety and without much injury being done to the plants; but in those of the thinner and more poor kinds, where the crops are in general the first season but thin on the ground and light, it may be advantageous to let them remain without being cut or fed down by stock, as in this way they may spread more, and form a better and more close sward in the following year. By the plants in this case being suffered to feed, besides the advantage just mentioned, they will have acquired a great vigour of growth, and the succeeding crops be greatly increased from the shedding of the seeds.

In all cases, in the succeeding summers, a crop of hay may be taken, and the after-grass be fed down with any sorts of stock but sheep till towards December, care being taken that they do not eat it in too close a manner, as where that is the case, from the largeness of the roots, they may be in danger of injuring the crowns of the plants. In the following autumns there will, however, be less risk in this respect, and sheep, as well as cattle stock, may be turned in and kept upon the pastures till they are all well eaten down, being always careful to shut them up as early as possible in the beginning of the year†.

The quantity of produce must of course be liable to vary much according to the

\* Kent's Hints.

† Ibid.



nature of the soil, and the care that has been bestowed in the preparation: on a medium of soil and culture it may probably be estimated at about two tons. The poorer and thinner stapled sorts of land, worth little more than five shillings an acre, will seldom afford less than from a ton to a ton and a half.

On the thinner sorts of soil it can seldom be cut more than once, but on those of the deeper kinds two crops are sometimes taken in the same way as with clover.

In its green state it is highly useful for all sorts of stock; though some suppose, that when given to milch cows the milk is not so well flavoured.

When made into hay it is an extremely nutritious fodder for working-horses, as well as other sorts of cattle. And the after-grass is highly valuable for weaning and supporting lambs.

As this sort of herbage is supposed to be improved by being nipped by the frost, it may be a proper practice not to turn upon these lays too early in the autumn.

The application of manure upon saintfoin lays is of great utility, when put on in the latter end of the second autumn after they have been laid down. For this purpose peat ashes are the best material where they can be procured. Other sorts of ashes are likewise found beneficial where these cannot be had. They should be applied so as to form a thin even dressing; foot has also been found of great utility when spread evenly over these lays about the beginning of January, in the proportion of about twenty-five bushels to the acre. And malt dust has been employed in the same way with great success\*. Where top-dressings of this sort can be applied every third or fourth year, the saintfoin crops, when well established in the soils, may be preserved in a state of vigorous growth for ten or fifteen years, and the land be considerably improved by the roots†. It usually attains its perfect growth about the third year; and begins to decline towards the eighth or tenth, if not well assisted by manure in the manner mentioned above.

It is, in some cases, a profitable application of this sort of crop to cut it before it comes into flower, for the purpose of soiling horned and other sorts of cattle, in the manner that has been described for clover.

The most usual application of it is, however, in hay, which it affords of the best and most nutritious quality, both for horses and other sorts of cattle. The method of bringing it into this condition differs but little from that employed for clover. It is cut immediately on its coming into full blossom; and as it remains but a short time in this state, as much expedition as possible is employed both in mowing and making the produce into hay. This, of all other grasses, requires the least pains

\* Synopsis of Husbandry.

† Kent's Hints.



in making. When the season is fine the hay-makers may follow the scythe, and, having turned over the swaths, throw them into wind-rows the succeeding day after the grass is mown, when it may be immediately formed into cocks, and the whole crop be fit for carting in a few days after it is mown: and though it may appear very green, and the stack when made take on a considerable degree of heat, there is no danger to be apprehended, provided the weather has been fair during the hay-making; as it is so far from taking harm by heating in the stack, that the contrary state is most to be feared; and for this reason care is necessary not to suffer the fodder to continue long either in the swath or in grass cocks, lest the sun and wind should dry it up too fast, and, by exhaling its juices, prevent its heating in the stack, and thereby render it of little value. In order to preserve its succulence, in some places they put a number of the grass cocks together, so as to form large cocks of a size to contain a load in each, and finish the stacks out of the cocks. It is likewise the practice with many farmers, when the crop is slight, to turn the swaths, and then run them into cocks with a three-pronged barley fork, following with a wooden dew rake, the head of which is of sufficient width to cover the ground occupied by three or four swaths; in this manner proceeding with the utmost dispatch, saving a deal of labour and expense\*.

In letting this crop stand for seed, it should remain on the land till the husks become of a somewhat brown colour, and the seeds are perfectly plump and firm, as by these means they will not only be better, but in less danger of being injured in the field from the little time that it will be necessary for them to remain, and also less in danger of being hurt by heating when laid up. After this degree of maturity is attained, the crop should be mown as soon as possible, and remain exposed in the swath till the upper surface is fully dried: it must then be turned over in a very careful manner, so as to prevent the seed from shedding, as much as the nature of the business will admit. This side being rendered perfectly dry and crisp in the same way, the crop is either threshed out upon cloths in the field, or laid up in stacks to be afterwards performed. The business of threshing out the seed in this crop, however, is much less troublesome than in that of clover. Where threshing-machines are in use, it may be threshed out with great facility in that method. When the season is favourable the practice of threshing it out in the first way is probably the most beneficial, as the stems, or haulm, may be laid up for the purpose of fodder in the stack.

The produce in seed is usually from about four to five coombs in some districts;

\* Synopsis of Husbandry.



but in others it will probably be much less, especially on the shallower sorts of faintfoin soils.

It is evident, from the facts that have been stated, that this is a plant of vast utility to the farmer, not only in providing a full supply of fodder for the support of stock, but of good green feed for the latter part of autumn, in soils that are adapted to its culture, as it is capable of affording a large produce, even on those thin poor descriptions of land that under other circumstances yield only a very scanty product either in herbage or hay. And in such as are of the better and more fertile kinds the quantity of crop is incomparably abundant. Its culture ought, therefore, to be extended to all those extensive tracts of lands in different parts of the kingdom that afford little or nothing under other systems of husbandry or modes of cropping, and which are not adapted to the growth of clovers.—This is particularly desirable, as it is an artificial grass that succeeds well in the ordinary methods of sowing, without the trouble or expense of either the drill or the hoe. It seems extremely probable, from different trials that have been made with this plant, that it is not by any means so confined in respect to soil as has been generally supposed\*, though there can be little doubt but that it answers best on those of the calcareous dry loamy kinds. On such as have had occasionally applications of lime it has been known to succeed in a perfect manner†.

The situations that are the most unfriendly to the growth of this grass are those where there is much stagnant moisture in the soils, or where they are wet and spongy; a considerable degree of dryness being essential to the healthy vegetation of the faintfoin plant‡.

The principal inconvenience which crops of this sort sustain is from the rising of coarse grasses, and weeds of different kinds, as it is these that, in a great measure, limit the duration of the plants, and not that of their age: the advantage of a proper and clean preparation of the land previous to its being sown is therefore sufficiently evident. Where, notwithstanding every precaution, such grasses come up so as to injure the faintfoin, harrowing has been had recourse to with success, when performed to such a degree as to leave the surface of the land in nearly the state of fallow§.

*Lucern¶.* This is another plant of the artificial grass kind, that may in some cases be cultivated with much profit and advantage, as affording a large produce of succulent green food, for the support of different sorts of stock, and likewise of hay for the winter fodder of horses or other cattle.

The soils most suitable to the culture of this plant are all those of the more deep,

\* Young's Eastern Tour, Vol. IV.

† Marshall's Rural Economy of the Southern Counties.

‡ Young's Eastern Tour, Vol. IV.

§ Ibid.

¶ *Medicago sativa.*



rich, and drier kinds, as those of the sound, mellow, loamy, gravelly and sandy descriptions; but on such as are retentive of moisture it should not be attempted, as the roots are liable to be greatly injured, if not wholly destroyed, by the stagnation of water about them. Weeping gravelly lands, and all such as are not well drained, are of course improper for this sort of culture. It is supposed by some, that for the successful cultivation of this crop, it is necessary that there should be a substratum of such a sort as is capable of stopping the descent of the roots at a certain depth, in order to prevent their exhausting themselves; but the depth of the mould, in this case, should be considerably greater than for that of the preceding grass, a foot and a half or two feet being mostly requisite\*.

In the preparation of the land the soil should always be brought into as fine a condition of mould as possible. This may be effected by repeated ploughing and harrowing, and the previous growth of such crops of the green kind as have a tendency to clean and render the land more fine and mellow. In this intention, some advise the taking of two crops of turnips, carrots, or cabbages, either in succession or alternating with each other; the turnips, in the heavier loams, being eaten off upon the land in the second autumn, before it is ploughed up. In either of these cases, from the hoeing and constant culture which is necessary, while the crops are upon the land, it will be left in a suitable state of cleanness and friability†. Others recommend fallowing as a better practice, the root weeds of every kind being carefully pricked out in the different ploughings and harrowings. From the great length of time that the ground must remain unemployed in this mode of preparation, it is probably, however, only capable of being practised with advantage where the lands are heavy and very full of weeds. Before the seed is put in, the soil must be rendered perfectly fine by ploughing it over as frequently as may be necessary, and breaking it well down by occasionally harrowing. It will seldom be necessary to make use of manure; but where the land is found to stand in need of it, the application is best made with the first of the green crops. The object to be constantly kept in view in this business is chiefly that of rendering the land perfectly clean from weeds, and at the same time highly mellow and friable.

*Seed.*—The seed of lucern is larger and of a more pale colour than that of clover; and as much of it is brought annually from Holland, it is commonly purchased in the seed-shops, the price varying from one to two shillings the pound. As seedsmen are apt to keep their seeds from year to year, it may be necessary to observe, that that which is perfectly fresh is the most proper for being sown, as small seeds in general vegetate in the most perfect manner when new. The proportion of

\* Kent's Hints.

† Annals of Agriculture, Vol. XXV.



LITTELL  
*Medicago lupulina*





... heavy, gravelly and sandy ... should not be attempted, as the ... by the flagellation of ... as are not well ... of ... should be ... of ... in order ... in this case, ... had ...

... should also ... of ... and ... of ... being ... either ... while the ... and friability ... of every kind ... From the great ... of preparation, it is probably, however, ... where the ... must be ... necessary, and breaking it well down ... necessary to make use of manure; ... the application is best made ... The object to be constantly kept in view is ... the land perfectly clean from weeds, ... mellow and friable.

... larger and of a more pale colour than that of clover ... from Holland, it is commonly purchased ... two shillings the pound. As seeds ... it may be necessary to observe, that that ... for being sown, as small seeds in general ... when new. The proportion of



LUCERN.  
(*Medicago sativa*.)

PL. XX.  
Vol. 2. p. 870









seed that is necessary is variable, according to the nature of the land and the manner in which the crop is cultivated. In the broadcast method, which has been found very successful, from eighteen to twenty pounds may be proper, while in that of the drill it will be considerably less, according to the distances at which the operation is performed. In two-feet equidistant rows the usual allowance is about six pounds; in those of eighteen inches, about eight pounds; in those of twelve inches, ten or twelve pounds; and in nine-inch rows, which are by much the best, from twelve to sixteen pounds may be necessary.

*Time and Method of Sowing.*—The most proper season for putting this sort of crop into the ground is as early as can be done in the spring months, as in this way plants may be fully established before the season becomes too hot. The latter end of March for the more southern districts may be the most proper period, and the beginning of the following month for those of the north. When sown late there is more danger of the plants being destroyed by the fly, as has been observed by Mr. Tull. If the plants be intended to be transplanted out in the garden method, it will also be the best practice to sow the seed-bed as early in the spring as the frosts will admit, in order that they may be strong and fit to set out about August.

With regard to the mode of putting in the crop, it should vary with the circumstances of the soil, and the mode of after-management that can be adopted with the most convenience. Where much attention cannot be bestowed in the business of hoeing and keeping the crop clean, the best method is that of sowing the land broadcast; though in this method the crop may not last so long in the ground. But in cases where the crops are capable of being kept in a sufficiently clean condition by repeated hoe culture, the drill may be more advisable, especially at narrow distances. Some, however, think it the best method in all cases\*.

The practice of transplanting can, perhaps, only be done in particular cases, or small pieces of deep land that are in great heart, and require the plants in consequence to stand thin and regular upon the ground, as in this mode they become large and of vigorous growth. In soils that are inclined to moisture at some depth below the surface, it may be an useful method of keeping the roots of the plants from being injured by their penetrating too deeply, as is more the case when the plants rise from seed†.

The seed may be sown either alone or with grain crops, in the same manner as clover: each method has its advocates, and it is probable that they may both be useful under different circumstances, as in the deeper and more fertile sorts of lands the first may be the most beneficial method, and in those of the lighter and less deep

\* Kent's Hints,

† Annals of Agriculture, Vol. XXV.



kinds the latter;—as in the deep, rich sorts of land there may be less loss of time in procuring the green produce for the use of horses or other sorts of stock, as well as the greater certainty of the crop succeeding. But in the lighter and more porous soils, by being sown with corn, the plants may be better protected in their early growth, as well by the shade as the moisture that will in that way be preserved. Some indeed speak of its superior utility, on the ground of long experience, in its being better preserved from the fly\*. Wherever this mode is made use of, the grain should however be sown thinner than is usually the case in proportion as the soils are more rich. Oats are preferable to barley for the purpose, as being less liable to lodge, especially when sown thin. From five or six pecks to three bushels, sown as evenly as possible, may be the best proportions, the smallest quantity being necessary on the richest soils.

After the grain has been sown and harrowed properly in, the lucern seed should be immediately sown by a regular even cast over the fine surface, covering it in with a light seed harrow; but it should not be too deeply covered in, two inches is fully sufficient. In the drill method the same system should be followed, the lucern seed being drilled in, either lengthways or across, at suitable distances, immediately after the corn has been put in†.

It is hardly necessary to observe, that the plats of ground sown for the purpose of raising plants to be set out in the garden method of culture, should always be without grain or other sorts of crops, in order that they may admit of having the plants properly thinned out and kept clean, and in a vigorous state of growth for being afterwards put out with the most advantage.

In regard to the proper distance of the rows where the drill mode of culture is practised, it should probably depend upon the state and circumstances of the soils: some advise two feet as the best distance in all cases‡, while others think equal distances of a foot in rich soils, such as are worth from thirty to forty shillings the acre, and nine inches those that are of inferior fertility, as from fifteen to twenty shillings the acre, the best general distances§. On soils of less value, it is probable that this culture can seldom be had recourse to with much benefit to the farmer. The last distance approaches much to the broadcast method, which is contended by some as the most appropriate in almost all cases||: of course it may be preferable, as it admits of being ploughed between by a suitable plough in the room of the harrow.

The seed, in whatever method it may have been sown, is, when good, rather rapid in its vegetation, beginning to sprout in the course of a week, and soon spreading itself over the surface of the land. And the sooner it attains its rough leaf the

\* *Annals of Agriculture*, Vol. XXV.† *Ibid.*‡ *Kent's Hints.*§ *Annals of Agriculture*, Vol. XXV.|| *Ibid.*



better, as it is then, like turnips, out of danger of being destroyed by the fly. Before these plants arrive at this state of growth, they are liable, especially in dry seasons, to be much injured, if not wholly consumed, by the ravages of the same sort of insect as that which is so detrimental to the turnip plant. Where the greatest part of the plants are injured in this way, it is probably the best method, when the crop has been put in alone, to plough up the land, and sow it down again with fresh seed as soon as possible. This is an advantage which the practice of sowing the crop alone has over that of putting it in with those of other kinds.

*After-management.*—As the economy of this plant is such as to render it incapable of being grown with much advantage where other sorts of plants, whether of the grass or weed kind, are apt to annoy it, much care and attention should of course be employed in keeping it clean and free from the intrusion of all such vegetable productions. This may be effected in different ways according to the methods in which the crop has been raised. Where the broadcast plan has been pursued, little is necessary where the land has been properly prepared, after the grain crop has been removed, except keeping all sorts of heavy stock from coming upon it. In a dry season, if there be occasion, the field may, however, be fed a little by calves and other very light stock, but they should never be kept long upon the plants at one time. When the second cutting has been made in the following year, if any grass shows itself, the land should be harrowed over in a moderate manner by a harrow which is not too heavy or too long in the tines, twice or more times, as may be necessary, in different directions, the grassy matter being collected by a small light implement of the same kind, and removed from the land. This business should be executed as soon in the early part of the spring as the nature and state of the ground will admit, as dry a period as possible being taken for performing the work. In the succeeding years two such harrowings may frequently be required, one in the early part of the spring season and the other in the close of the summer. But in these cases, especially where there is much grass appearing, a much heavier sort of harrow should be made use of. Some advise one of such weight as is sufficient for four horses, and which does not spread more than four or five feet\*; but in most cases, especially when the business is so frequently done, one that requires less draught may be adequate to the purpose, as where such large heavy harrows are employed, there is much danger of injuring the crowns of the plants, and thereby causing their destruction; whereas by the use of lighter ones they are mostly much benefited from the mould being stirred about their roots. After these harrowings, as in the above case,

\* Annals of Agriculture, Vol. XXV.



the weeds should be brought together and removed from the ground. Where the crops are thin and patchy, seed in proportion to the deficiencies should be sown over such places before the harrowings commence each time. In every case the rollers should be applied immediately after the operation has been performed, not only for the purpose of pressing the mould about the roots of the plants, but to render the surface perfectly level and fit for the scythe.

In the broadcast method of culture, where the produce is not to a considerable extent, it is probably better to feed the crop by light cattle stock in the autumn than mow it.

In the drill-sown lucern some recommend, where the rows are sufficiently evident in the autumn season, after the grain has been secured, the passing of a small shim between them, in order to extirpate all the weeds and grassy materials, as well as to loosen the mould about the roots of the plants, and, that they may be rendered more perfectly clean, the hand-hoeing of the plants in the rows\*. In the succeeding year still more particular attention to the use of the shim and hoe will be requisite. The business should be begun as early as the state of the soils will safely admit of its being executed; being continued occasionally in such a manner, during the whole summer, as is sufficient for preserving the crops perfectly clean and free from all sorts of weeds. But in order to accomplish this in the most complete way, great circumspection is necessary, immediately after the lucern has been cut, to the extirpation of the natural grass plants and the weeds of other kinds, as at this period they can be discovered and removed with the greatest facility and dispatch.

The crops raised in the transplanted method, as they are put in so late in the summer season, will demand but little regard in the autumn: one or at most two slight hoeings may be sufficient for the purpose. But in the following year's culture the same management will be proper as in the preceding case.

Some advise it as a good rule in these cases to give full hoeings, either of the horse or hand kinds, as soon as weeds appear, every time after the crops are taken off. If the plants are perfectly straight in the rows, which should always be the case, "a shim may be had recourse to with the greatest benefit, as it may be drawn so closely to the plants as in a great measure to save the expense of hand hoeing, as in such cases it will only be necessary to extirpate the weeds or natural grass plants that may have established themselves among the lucern plants in the rows, which is capable of being effected in a very complete manner by the use of a pronged hand hoe†. It is further recommended by the same cultivator, never by

\* *Annals of Agriculture*, Vol. XXV.

† *Ibid.*



any means to suffer fields of this sort to become weedy, under the supposition that the produce may not cut well, or be free from dust; as, where it is of sufficiently vigorous growth, and of a suitable distance in the rows according to the nature of the land, there can be no reason for such an injurious practice; as it is only where the planting is executed at larger distances than the condition of the soils will permit that any inconvenience can be experienced in this way.

Where hand-hoeing is the method chiefly depended upon for keeping crops of lucern in a proper state of culture, much of the business may be performed by women, or even children, and the expense be thus considerably lessened.

When the soils on which this plant is grown are not of considerable fertility, the occasional application of manure may be of great advantage in thickening and increasing the quantity of crop. For this use clean well rotted dung is probably by much the best manure, as where earthy composts, ashes, or soot are employed, they are apt to promote the growth of, or bring up common grasses too much. The latter are, however, sometimes sown over the crops in the winter season. The dung is advised by some to be applied in the quantity of about twenty tons to the acre every five or six years\*. Others, however, think it a better practice to put a light coat on annually in the early spring season †.

The culture of this sort of crop is obviously attended with considerable expense, both in its first establishment and the after-management which is necessary to ensure its success. The inexperienced cultivator should not therefore commence this kind of husbandry too hastily, without considering how far it may suit his circumstances. The additional expenses in putting in this sort of crop, with those of the grain kind, in the drill method, the necessary annual charges afterwards, and the produce in the supporting of horses, are shown in one view below ‡.

As this is one of the most forward of the natural grasses, it frequently attains a sufficient growth for the scythe towards the end of April or beginning of the fol-

\* Annals of Agriculture, Vol. XXV.

† Kent's Hints.

|                                  | ‡ Extra Expense. | £.    | s. | d.   |
|----------------------------------|------------------|-------|----|------|
| Two spring ploughings extra, are | -                | 0     | 18 | 0    |
| Harrowings                       | -                | 0     | 2  | 6    |
| Eight pounds of seed             | -                | 0     | 8  | 0    |
| Drilling                         | -                | 0     | 2  | 6    |
| Horse-hoeing in autumn           | -                | 0     | 2  | 6    |
| Hand-hoeing ditto                | -                | 0     | 5  | 0    |
|                                  |                  | <hr/> |    |      |
|                                  | First year       | £.    | 1  | 18 6 |







the weather is warm, and the lucern at no great distance. Besides, the food is eaten better when given quite fresh.

The produce of this sort of crop in converting it to the purposes of feeding cattle must necessarily be different under different circumstances; but an acre can seldom when under proper culture and management, support less than from three to five or six horses or other cattle during the six summer months; the profit of which cannot be less than from seven to ten or twelve pounds.

And in letting it remain for hay, which is less advantageous, in the three mowings an acre where the crop is good will seldom afford less than from three to five tons of dry hay. In Mr. Arbuthnot's trials, the produce was four loads, but in those of others on rich grounds it was five. In making this sort of plant into hay the same directions should be attended to as for clover; the less the produce is shaken about, the better, provided it be sufficiently quickly dried; as the leaves will be more fully preserved on the stems, and the hay of course more valuable. From its greater succulence it will in common require rather more time than clover or saintfoin in making. As this sort of hay is held in less estimation than that of either of the above grasses, it should be consumed at home by the farm horses or other stock, and that of other sorts sent for sale.

In the application of the crop the principal and obviously the most advantageous practice is that of feeding horses, neat cattle, and hogs. But as a dry fodder it is also capable of affording much assistance in many cases. And as an early food for ewes and lambs, it may be of great value in particular cases. As this plant bears repeated cutting better than most of those of the artificial grass kind, springs in a more quick and expeditious manner, and affords a healthy nutritious food, in feeding it must be of vast utility to the farmer where horses and cattle form a large part of his stock. With horses, in this way, it has been found by some to answer better than any other sort of green food that has been tried—the number of cuttings that it admitted of being on different soils and under different modes of culture, from about three to five, affording a produce of green herbage adequate to the support of from three to four or five horses for a period of nearly six months in the summer season. And though much of this vast advantage, in the support of these animals, may with propriety be ascribed to the economy of the consumption of the food that unavoidably takes place in this excellent practice\*, the real produce in green food is without doubt larger than in most other grass crops. The broadcast crops in the trials

\* Young's Eastern Tour, Vol. IV.



of some cultivators appear to have been more profitable in this mode of consuming the produce than those of either the drilled or transplanted methods of culture. In the practice of Mr. Hall, the former supported from four to five horses for twenty-six weeks, while the crops transplanted in rows two feet asunder only afforded produce sufficient for the keeping of three. And in those of Mr. Clayton, in the broadcast without grain, five horses were kept from the middle of May till Michaelmas, while that drilled in equidistant rows, at the distance of eighteen inches, only supported four\*. There are many other facts that lead to the same conclusion.

On very rich soils the drilled lucern will, without doubt, when the plants are kept perfectly clean, and the mould well stirred between the rows and laid to their roots afford an abundant produce, perhaps more so than in the broadcast, but to do this great attention in the culture must be bestowed.

In its application in the soiling of cows and other sorts of cattle in the fold-yards, and in the feeding and fattening of oxen, its importance is equally great. It is found that in soiling cows, the proportion of this sort of food consumed, in twenty-four hours, is from about sixty or seventy to upwards of a hundred pounds, in those which are of the middling-sized kinds; an acre maintaining in the proportion of about four for twenty weeks. In other trials larger proportions of stock have been kept by this practice. In feeding cattle with this sort of food in its green state, care is necessary, however, not to give the animals too largely at a time, especially when it is moist, as they may be *hoven* or *blown* with it in the same way as with clover.

The trials in fattening bullocks, or other cattle, with this green fodder are not numerous; but they are sufficiently so to prove its utility in such application. In Mr. Young's trials, cattle were found to increase fast in flesh by it, paying at the rate of four shillings and sixpence a head per week, which is considered as a great proof of the value of the plant: in this view its superiority to tares he thinks prodigious†. It has also been considered of great value in this view in Ireland, by Mr. Herbert, after much experience. The great power which it possesses in fattening is, indeed, rendered sufficiently evident, by the sudden effects which it produces in soiling horses. In most instances they get into high condition in a short time, becoming "fat without oats or hay" in some cases‡.

Sheep have likewise been fattened on this green food with great success in Mr. Baldwin's trials§.

\* Young's Eastern Tour, Vol. IV. † Annals of Agriculture, Vol. XIV. ‡ Ibid. Vol. XXV. § Ibid.



In soiling hogs in the fold-yards it has also been attended with considerable success. And it has been suggested, that as these animals do not bite so closely as sheep, they may be admitted upon the crops with greater safety. A plot of it contiguous to the yards might in this view be highly beneficial\*.

It is sufficiently clear, from these statements, that this is a highly beneficial method of disposing of lucern crops. Its vast superiority over that of making them into hay, as well as the expense, product, and neat profit in cultivating them on different soils, may be seen at one view in the following table†.

The utility and application of the hay produced from this grass has been already mentioned.

The result of the comparative experiment, made by Mr. Anderdon, with this crop and those of burnet and saintfoin, shows its great superiority over them‡.

Though crops of this sort should not, by any means, be fed close with sheep stock, it is probable that, in particular cases, they may be applied as an early green feed for ewes and lambs with great utility and convenience, as they may be re-

\* Annals of Agriculture, Vol. XXV.

| † Soils.             | Application.                 | Expenses. | Product. | Profit.  |
|----------------------|------------------------------|-----------|----------|----------|
|                      |                              | £. s. d.  | £. s. d. | £. s. d. |
| Averages of 5 crops. | Light sandy loam Soiling     | 1 14 6    | 13 0 0   | 11 5 6   |
|                      | Rich black loam Hay          | 5 0 8     | 11 5 0   | 6 4 4    |
|                      | Good loam Soiling            | 3 15 0    | 14 7 6   | 10 12 6  |
|                      | Good loam Soiling            | 3 3 6     | 9 0 0    | 5 16 6   |
|                      | Rich deep sandy loam Soiling | 3 11 1    | 7 0 11½  | 3 13 11½ |
|                      | Averages                     | 3 8 11    | 10 18 8  | 7 10 5   |

|                                           |     |
|-------------------------------------------|-----|
| ‡ Lucern at four cuttings green, produced | 159 |
| Burnet                                    | 84  |
| Saintfoin                                 | 112 |

The disadvantages of making them into hay stand thus :

|                    |      |        |      |
|--------------------|------|--------|------|
|                    | lbs. |        | lbs. |
| Lucern in grass    | 57½  | in hay | 22   |
| Burnet in ditto    | 25½  | in hay | 7    |
| Saintfoin in ditto | 29½  | in hay | 9    |

One cutting of each.

These facts fully show the great loss and disadvantage of employing in the way of hay the more succulent sorts of vegetable productions that are capable of being cut and soiled in their green state.



lied on for this sort of feed much sooner than any other kinds of artificial grass crops, especially in soils of the rich, dry, and warm descriptions; being often ready for the purpose soon after the middle of March, affording a good bite through the whole of the following month, the most difficult period for the providing of suitable support for this kind of stock. The benefit produced in the healthy growth and improvement of the lambs in this mode, will much more than counterbalance any loss sustained in the first cuts for foiling of horses. The sheep should not, however, remain on longer than while the first shoots are eaten down.

On the whole, though this plant is capable of being thus usefully applied, considering the very great expenses which are necessary in raising and keeping lucern crops in a state of production, and their affording but little produce, especially when sown without corn, for the first years, notwithstanding they appear to yield a great advantage in the practice of foiling animals, it is probable that much of the profit depends upon the method of consuming them, and not on that of the particularly advantageous nature of the plants. Its superiority to clover, when the differences in the expenses of their culture and other circumstances are fairly brought into view, will not, perhaps, appear so great as many on a superficial observation may have supposed. The point in which it most materially excels that invaluable plant is the duration, or time which it lasts in the ground, after being once introduced; continuing from ten to fifteen and even twenty years, according to the state and nature of the soil, and the attention that is bestowed in the after-management. This is, undoubtedly, a circumstance of the first importance, in cases where the cultivator wishes to avoid the trouble and expense of grain crops, as he can keep a suitable extent of land under this crop for the purpose of foiling his stock without them, while with clover it is utterly impossible\*. Where the proportion of land is small, and the quantity of cattle and horse stock disproportionately large, it is a plant admirably calculated for the cultivator's purpose, when grown conveniently to the farm yards and kept in due order by proper cultivation. It has also been recommended on dairy farms as of great utility in supporting the cows and increasing the quantity of milk†. Where the soils are suitable, a few acres under this grass round the house must in almost all cases be valuable for the purpose of early green food.

On attempting to break up lands that have been long under this sort of crop, it has been sometimes found from the great strength of the roots of the lucern plants, and the consequent difficulty of destroying them, that the crops have been restored in

\* Young's Eastern Tour, Vol. IV.

† Annals of Agriculture, Vol. XXV.



such a manner as to induce the cultivators to leave it again for the production of this grass\*. In situations where such grounds could be conveniently flooded, or covered with water occasionally, they might, therefore, be very advantageously converted into good meadow or grass lands; a sort of application that has long since been recommended by a French writer †.

When such lands are perfectly broken up, they afford, in most cases, admirable crops of the grain kind. Oats, as being the least injured by a luxuriant growth, may in general be the most advisable as the first crop.

The nature, cultivation, and modes of applying different sorts of artificial grasses in the feeding of live stock being explained, we shall consider a few other plants of the herbaceous kind, which seem properly to belong to this place, from their great importance and use in affording plentiful supplies of green food for the support of cattle or other sorts of live stock.

*Tare* ‡.—This is a plant which, from its tall, close, hardy growth and succulent nature, is capable of being introduced with vast advantage in the manner of those of the artificial grass kind, between different sorts of grain crops, with the view of preventing the fertility of the land from being too much expended, and at the same time procuring an useful supply of green or other fodder for the consumption of horses or other descriptions of stock. It has indeed been contended by an intelligent cultivator §, that it “may be made the means of enabling the arable farmer to support as much live stock as the grazier,” as while crops of this sort remain upon the ground they afford larger supplies of the best kind of green food on the acre, than the most rich and fertile grass lands; and they may be taken from the ground at so early a period in the summer season as, on the friable loamy soils, to admit of a clean crop of turnips being obtained from the same land in the same year, and of those of the more heavy kinds being sown with wheat. And while they are capable of being raised with success on most kinds of soils and situations, they support and fatten cattle and sheep of different sizes and breeds in an expeditious manner. Besides, they afford a good preparation for other sorts of green crops, and in that way keep up the successions of such kinds of food for the fattening of additional quantities of animals; and in that way produce abundance of manure in situations where it could not otherwise be procured. In short, he supposes that by a judicious combination of this plant with those of turnips, clover and saintfoin,

\* Young's Annals, Vol. XXV.

† De Serrès en Théâtre d'Agriculture, p. 442.

‡ *Vicia sativa*.

§ Mr. Middleton.



the poor downs, sheep-walks, and other waste lands, may be rendered from ten to thirty times more valuable than they are at present.

But, however sanguine these observations may be, there cannot be any doubt but that the tare may be an useful object of cultivation in the view of improving the land, as well as the supporting of a larger stock, and a plant that ought to be more generally grown in most situations, in proportion to the extent of the stock that is kept.

The common tare is distinguished by writers on husbandry into two sorts,—the *winter* and *spring* tare: the latter is probably a variety of the above species. It is, however, much less hardy in its habits than that of the former or spring kind; the plants when wholly of this sort being capable of resisting the effects of the severest winter seasons in this climate.

In cultivating these plants, with a view to ascertain their difference in respect to hardiness, the Rev. Mr. Laurents of Bury, in Suffolk, is stated by Mr. Young to have made the following experiments:—On the 30th of September 1783 he sowed seeds of the winter tare and of the spring tare near to one another, in the same soil and exposure, and covered both with a coat of crumbled mould one inch deep. The weather proving mild, the spring tare soon made its appearance; and two days afterwards the winter tare came up. This ascendancy the former did not fail to maintain over the latter until the middle of December; at which time that was about six inches high, and this not above four. They were both in a vigorous and thriving condition when a frost came on and continued for some weeks. On a thaw taking place, he found the spring tare lying on the ground, slimy, and putrefied to the very root. The winter tare had received no damage. It grew up afterwards, and was ripe before the middle of August.

This difference in the effects the frost had on them, led him to view the state of tares in more open situations; where he found that in some grounds scarce any plants had been destroyed, in others patches of something in a state of putrefaction, resembling the dead tares in his garden, were observed.

And on the 6th of March 1784, both sorts were again sown in the manner described above; and in their springing up and growth, a progress similar to that which he had remarked in autumn was observed. Near a week later than the winter tare of the autumnal sowing, the spring tare of the vernal sowing arrived to perfect maturity. But the winter tare of the vernal sowing was mildewed, not a single pod of it ripening.

From these two circumstances there appears a material difference in the con-



stitution, if he may so call it, of the two sorts of tares in question. He adduces nothing as to the trifling difference in the colour and size of their seeds, but passes on to the only visible marks of distinction he was able to trace in watching the process of the two experiments. And this is a disparity in the first leaves of the upper part of the stalks of the plants when gathered about the end of November, while the leaves on the branches, which afterwards issue in the lower part, and in time form the bulk of the plants, resemble one another in the two vetches. This is all he has been able to offer towards the decision of this point. These differences may be seen by consulting a plate in the second volume of the Annals of Agriculture.

It has been observed by the author of the Synopsis of Husbandry, that “the seeds of the winter and spring tare are not easily discriminated, being nearly alike in size and every other characteristic; but on the appearance of the blade the difference is at once to be perceived. The winter tare vegetates with a seed-leaf of a fresh green colour, whereas the spring tare comes up with a grassy spear of a brown dusky hue.”

There is likewise a second variety which is denominated the *white* tare, but it is tenderer than even the spring tare, of course seldom employed in field culture.

The tare is a plant which in respect to soil admits of considerable latitude, growing without difficulty on all the varieties, from the thin gravelly to those of the deep and stiff clayey kinds, but flourishes in the most vigorous manner on those gravelly loams\* that are not too moist.

In the preparation of the land for this crop less care is necessary than for many other sorts of grass crops, as it will succeed well where the soil has not been much broken down or reduced into fine mould; but it always grows in the most perfect and vigorous manner where a degree of fineness has been produced in the land. Two ploughings, with occasional harrowings in the intermediate times, may in general be sufficient for the purpose at whatever season the crop is put in. They are sometimes sown on one ploughing, especially the winter crops; but the practice is not to be recommended, especially on the stronger sorts of soils. In such soils as are not rich it is a good practice to manure for this crop†.

*Seed.*—As the seed of the spring tare does not succeed well when sown for the winter crop, nor that of the winter kind when put in for the summer produce, care should be taken to keep the seed of the two sorts as perfectly distinct as possible. And as they are, from their being both of nearly the same colour and size as well as

\* Modern Agriculture.

† Suffolk Report.



their agreeing in other particulars, liable to be mixed in the seed-shops, it may be the best practice for the cultivator to preserve his own seed, as by that means he may not only be certain of having the seed good in its quality, but of the right sort, and of course may depend more fully on his crops.

It has been suggested that steeping the seed in dry seasons may be of utility in promoting the quick vegetation of the crop\*.

The quantity of seed should vary according to the nature of the soil and the method of sowing. From two bushels to two and a half are the proportions recommended by some in the broadcast method. Others advise three bushels; but on medium soils in the middle of the season the former may be fully sufficient. Where the land is more rich and the seed put in early, less may answer the purpose; but on poor sorts of land, where the seed is sown late and the climate is backward, the latter quantity may not be too much. In the drill mode, at six inches, two bushels are enough. When the crops are either to be cut for soiling or to be fed down, the proportion of seed should be increased, as not only a greater produce is thereby provided, but the growth of the crops rendered more quick.

*Time and Method of Sowing.*—The periods of sowing tare crops vary with the intentions of the cultivator, but the winter sowings should be performed some time between August and October: in late exposed situations and poor soils more early than in those of the contrary. In the former the beginning of August may not be too early†. In other cases the latter end of that month or the beginning of the following may be better. It should, however, for the general crop always be done in such time as that the plants may be perfectly established in the soil before the cold season begins, as by this means the crops succeed better. For the spring sowings, from the beginning of March to the end of April may answer very well; but the sooner the better, as the plants will have got the more firm hold of the ground before the hot season sets in. It is of great advantage in providing a due succession of green food for the spring consumption to sow at different periods in the autumn.

The method of sowing is mostly that of the broadcast, which should be performed as evenly as possible over the surface, the seed being afterwards well covered by harrowing, in order to prevent their being picked up by birds, and ensure their perfect vegetation. In rich clean soils it is probable, however, that the row method would succeed well at six or eight inches with this sort of crop, as is the case in some of the southern districts‡. With some intelligent cultivators it is the custom to sow a little

\* Corrected Report of Middlesex.

† Ibid.

‡ Synopsis of Husbandry.



rye with their winter tare crops, and a small quantity of barley with those of the spring. But as plants of different sorts never succeed well together, it is probable that little advantage can be derived from the practice, especially as the tare is not a plant that stands much in need of protection in the early stages of its growth, and may be injured by too much shade.

Crops of this sort are mostly cultivated after wheat or barley; but they may be grown after almost any kind where the land is in good heart.

*After-management.*—As this sort of crop covers the land in a very complete manner where it is sufficiently full, it does not require so much attention during its growth as many others. Some nice cultivators, however, make a point of hoeing up and drawing out all the more coarse and rank kinds of weeds that are in danger of doing injury to the tare plants, and which they cannot smother and overpower. This business should be performed as early in the spring as possible. And in order that the land may be in better order for the scythe, a light roller may be passed over the crops when the season is tolerably dry in the very early spring months\*.

When the parts of crops of this sort that have run to seed, or any others, are left for the purpose of a supply, it is the usual practice to cut and *wad* them in the same manner as for peas, in order to their being afterwards housed or stacked, and threshed out in the winter season.

In making tares into hay, more attention is necessary than in those of most of the artificial grasses, as wet is more injurious to them, and they require more sun and air; but in other respects they demand the same cautious management in order to preserve the foliage from being lost. The time for cutting for this purpose is when the blossoms have declined, and they begin to fall flat†. When well made the hay is of the most nutritious quality. The produce in tare crops, as in those of other sorts, must be different according to circumstances; but when they are good, in the winter kinds it is commonly considerable. The writer of the Report of the State of Agriculture in Middlesex states it as the result of experience, having frequently weighed green tares, to be twelve tons per acre; and when made into hay, at about three tons;—the value of the produce, estimating it as if the whole were made into hay, being in that district from twelve to fifteen guineas the acre, and in places where other sorts of hay sell at fifty shillings or three pounds, at from seven pounds ten shillings to nine pounds. The spring tare crops are in general lighter, and more liable to be injured by a dry season than the winter.

\* Report of Middlesex.

† Synopsis of Husbandry.



The produce in seed is likewise considerable: by some it is stated at from three to six sacks\*; in other instances forty bushels or more have been obtained from the acre. This sort of seed is greatly preferred by pigeons, and it may probably be used for poultry with advantage. In the above statements the produce in green food is undoubtedly large; but from the succulent nature and luxuriant growth of the crops it cannot probably be much too high.

In the application of tare crops, there can be little hesitation in pronouncing that of soiling them with horses or other stock on the farm, as the most advantageous and beneficial method. The vast advantage of this mode is rendered particularly evident by the great loss which we have just noticed in converting them into hay. In the practice of soiling much loss may be sustained by cutting the tares at too early a period†.

An intelligent agricultor is of opinion that the farmer's stock should be wholly supported on them from the time they begin to blow till the blossoms begin to fall off, and the formation of pods takes place. On account of the risk from wet, he recommends that all the stock of a farm should be soiled on them green, as it will have the good effect of taking it off the grass land long enough to allow of its being mown for hay; and by this means the meadow hay be much increased in quantity, and there will not be so much occasion for pasture, the tares abundantly supplying its place. Besides, at the time the cattle return from green tares, the grass land, in the mean time having been mown, may be ready to receive them‡.

It is further observed that, as it would be wasteful in the extreme to turn live stock into a field of tares, as their treading and lying down would do great mischief to the crop, even by feeding it in small patches hurdled off, the most advisable method would be to mow the tares of the first half acre, and to carry the produce into the stables, cow-houses, and fold-yards, or on to poor land to be consumed by stock, then to hurdle the growing tares from such *cleared ground*, into which put the stock and feed them all with the tares, given to them in racks, removing the hurdles and the racks forward daily to the edge of the growing tares; which will manure the land uniformly, and deposit all the urine in the soil§.

In the Gloucester Report another good method is recommended, "which is to feed them through rack hurdles, which are made the same as the common five-railed ones, only leaving the middle rail out, and nailing upright pieces across, at proper distances, to admit the sheep to put their heads through. A swath of vetches

\* Suffolk Report.

† Ibid.

‡ Middlesex Report.

§ Ibid.



being mown in the direction you wish to plough the land, a sufficient number of these hurdles, allowing one to five sheep, are set close to it: at noon the shepherd mows another swath and throws it to the hurdles, and the same at night; next morning, a swath being first mown, the hurdles are again set: thus moving them once in the twenty-four hours, by this trifling additional trouble the vetches are eaten clean off, and the land equally benefited."

In Gloucestershire and Worcestershire they sow tares as pasturage for horses, and eat them off early enough to allow of turnips being sown the same season\*. In wet seasons, where the tare crops are large, the stems are, however, apt to become rotten upon the ground; in this condition such food often proves prejudicial to horses; in such cases it will therefore be imprudent to cut them any longer for the purpose of foiling†.

In Suffex tares are of such infinite importance that not one-tenth of the stock could be maintained without them: horses, cows, sheep, hogs, all feed upon them. The last sort of animals are foiled upon them without any other food. This plant maintains more stock than any other plant whatsoever. Upon one acre Mr. Davies can maintain four horses in much better condition than upon five acres of grass. Upon eight acres he has kept twelve horses and five cows for three months without any other food: no artificial food whatever is equal to this excellent plant. They find this crop to be a hearty and most nourishing food for all sorts of cattle. Cows give more butter when fed with this plant than with any other food whatsoever.

By one crop of vetches succeeding another, Mr. Halfhead, in the same district, insures a crop the whole summer of the best food that can be given to cattle; after this he sows turnips, then wheat‡.

Where large stocks of sheep are kept, tares are exceedingly useful; for they come in at a time when rye and turnip crops are eaten off, and before the clovers and other grasses are in sufficient forwardness for being turned upon, and afford a seasonable supply of food for ewes and lambs. It is recommended to wait till the tares have gained a sufficient increase of stem before the sheep are turned in, and then to divide the ground by hurdles, in the same manner as is practised above. By this means there will be little waste, and the ground be enriched in a much higher degree than if the stock had been suffered to ramble over the whole crop§.

As from the great closeness and shade which is produced in these crops the land becomes much improved and rendered more clean and mellow, such plants

\* Withering's Botanical Arrangement, Vol. III. p. 622.

† Synopsis of Husbandry.

‡ Annals of Agriculture, Vol. XXII.

§ Synopsis of Husbandry.



should constantly be cultivated wherever the soils and situations will admit, especially if the keeping of much live stock be the object. In cold exposed situations, where vegetation is late in the spring months, they are not so proper: it may sometimes under such circumstances be more advisable to raise clover crops, as it will not be so much later as to render it much less valuable, and at the same time be more certain\*.

Tare crops form an excellent preparation for wheat in all the more strong and heavy sorts of soil, and for both grain and turnips in those of the light kinds; but as they have much effect in rendering the lands on which they grow more light, open, and porous, they may sometimes, in the latter case, bring it into too loose a state for the successful culture of that crop, as it requires a rather close texture of the land.

There are other species of this genus of plants that may, probably, be introduced into cultivation with benefit to the farmer, either in the view of affording good pasturage, or as supplying large quantities of green food, though they have not yet been sufficiently subjected to the test of experiment either in the soiling, feeding, or pasturing of animals, to fully decide on their merits or utility.

The Bush Vetch (*Vicia sepium*) is a species of tare that promises much advantage as a pasture plant. Its roots are said to spread much laterally just below the surface, and to send forth numerous stems in the spring of the year close to each other; which, as they have a broad-tufted top covered with many leaves, a close pile is formed without any other plant. It does not rise to any great height; but from its springing up very quickly after being cut or cropped, it seems to be properly adapted for pasturage. On fertile soils, however, it grows to a sufficient height for the purpose of hay. As the stalks grow so closely together, there is, however, danger of its rotting at the root in moist seasons. Though it produces abundance of seeds, they are very apt to be destroyed in the pod by insects in their vermicular state. It appears to succeed best in clayey soils, and abounds pretty much in foliage, affording seeds similar to those of the common tare†. It has been observed to shoot earlier in the spring than any other plant eaten by cattle, and to vegetate late in the autumn, continuing green all winter. A small space in a garden was sown with it in drills, and in the second year cut five times, producing at the rate of twenty-four tons per acre of green food, which would be nearly four and a half tons when dry‡.

The chief difficulty in the introduction of this plant arises from the causes stated below.

\* Modern Agriculture, Vol. II.

† Anderson's Essays, Vol. II.

‡ Bath Papers, Vol. III.



Mr. Swayne has remarked that, though very palatable to cattle, great difficulty arises in the cultivation of it on a larger scale, from the *larvæ* of a species of *atteleabus* frequently devouring the seeds \*.

And the Tufted Vetch, (*Vicia cracca*) from its rising to a considerable height in the stem and affording much foliage, might likewise be useful for the purpose of eating as a green fodder, as the produce would be considerable, and the plant is easily cultivated. It would also yield a great deal of hay. It has been observed to improve the condition of poor lean cattle beyond any other plant †.

The Everlasting Pea (*Lathyrus latifolius*) is also a plant which, from its large growth and foliage, might afford large supplies of green food, or of hay. A gentleman of much experience lately assured me that cattle eat it with great avidity, and that it is highly nutritious; and it has been long ago suggested as capable of being cultivated with advantage for these uses by Dr. Anderson.

We wish to draw the attention of the farmer more particularly to plants of this kind, as they are not only in general extremely productive in respect to quantity of food, but, in all the trials which we have been enabled to make upon them, very nutritious and fattening. And, in addition, they have mostly the very desirable property of being eagerly fed upon by most sorts of live stock. It is not to be hastily supposed, from their appearing of a coarse nature, that they may not be of advantage even in pastures, as it is now well known that close and judicious feeding can effect much in rendering the coarsest kinds of herbage more fine and grassy.

*Chicory* ‡. This is a herbaceous plant of the succulent perennial kind, that has been lately introduced into cultivation for the purpose of affording green food for the summer support of different sorts of live stock. It seems to have been first fully brought to the notice of agricultors by the experiments and observations of Mr. Young, detailed in his very useful work, the Annals of Agriculture. The plant is, however, supposed by Professor T. Martyn, in his edition of Miller's Dictionary, to be a highly improved variety of common succory; as in its wild state that plant is dry, hard, and without much succulence. It is capable of being grown on most of the loamy descriptions of soils, and even in some of the more light brashy sorts of lands, and other poorer kinds, but succeeds the most perfectly in such as are not too much retentive of moisture.

In respect to the preparation of the soil, it is probably less particular than many

\* Withering's Botanical Arrangement, Vol. III. † Plott's Natural History of Staffordshire, p. 204.

‡ *Cichorium Intybus*.—It is likewise known by the title of Wild Succory.



other similar plants, but answers in the best manner where the land is in a tolerable state of fertility, and has been rendered in some degree fine and mellow. When it is put in with other sorts of crops the same kind of preparation must be employed; but when sown alone the ground should be rendered fine by two or more ploughings, at suitable seasons, according to the nature of the soil, and repeated harrowings.

*Seed.*—This is best when collected from the plants by the cultivator, as, like most other sorts, it is liable to be mixed in the shops. It vegetates in the most perfect manner when new.

The quantity of seed which is necessary for the acre must, as in other sorts of crops, of course vary, according to the nature of the land and the intentions of the farmer; but the usual proportion, whether sown alone or with grain in the spring, is from ten to twelve pounds. In the row method of sowing, at the distance of a foot, from seven or eight to ten pounds may, however, be fully sufficient. As the plant is not of the tillering or spreading sort, a full proportion of seed should, however, constantly be put in, that the ground may be well covered with herbage.

*Time and Method of Sowing.*—The period of putting in chicory crops must be regulated by the method in which the business is performed, and the views of the cultivator. When it is sown without other sorts of crops, the work may be executed at any time from about the middle of March till the latter end of the summer; but with corn it must depend on the season they are put in. It is sown with both oats and barley, but the first will obviously admit of the more early sowing. From the plant being hardy, it should, probably, be put into the soil as early in the spring as possible. Mr. Young found it less liable to be injured by grain crops than other sorts of grasses, and to succeed well with most of them.

It is mostly sown in the broadcast method, after the surface has been rendered fine and covered in by a light harrowing. But from its growing with the greatest luxuriance where it is the most open and has the greatest benefit of free air, it is suggested as well adapted to the row method of cultivation\*.

*After-management.*—Where the crop has been put into the ground in the manner directed above, little attention is necessary afterwards, especially when cultivated in the common broadcast method; but where drilled in rows, the use of the hoe will be required to keep the intervals as well as the plants in the rows clean, and the ground well stirred.

Crops of this plant, from the great quickness and luxuriance of their growth,

\* *Annals of Agriculture.*



are capable of being repeatedly cut in the summer months, for the purpose of foiling horses and other sorts of stock. It should not, however, be cut more than once or twice the first season, but in the following summers the operation may be performed three or four times, according to circumstances. Mr. Young advises four cuttings, in order to prevent the stems from running up too much and becoming dry, sticky, and less nutritive\*.—The proper times are to begin about April or May, and to continue it every other month till October.

Its produce when cut green is larger than that of either of the two preceding plants, affording, in Mr. Young's trials, upon the average of four years, thirty tons to the acre: this is probably, however, a larger produce than the plant is capable in general of affording.

It is only in favourable seasons that this coarse juicy plant can be made into hay with success; nor is it well suited for the purpose, being of much greater advantage when consumed in its green state. Its produce in this way is stated at from three to four tons the acre†. This sort of hay is, however, asserted to be nutritious.

When left to run up to stem and seed the produce is considerable, amounting in the third year to more than four hundred weight on the acre.

The most useful application of this sort of crop is probably feeding of cows and other sorts of cattle, and the foiling of these as well as horses, as it springs more rapidly than either saintfoin or burnet; but it is likewise found to answer admirably for pasturage for sheep, as it is less injured by close feeding than many other plants‡.

“In a comparative experiment made on a small piece of land of a wet, sandy, friable, loamy soil, with marly bottom, drained, on a cabbage preparation, sowed oats with chicory and various other seeds—the oats were mown at harvest, but had only been used as the means of laying down: in May, when the grasses were mown and weighed green, those with chicory were most productive. No rain fell till the 11th and 12th of July, when it was very heavy. On the 14th of this month, cut the chicory crop: the others had not any thing worth mowing. In August, cut all again, when the chicory crop had much the advantage in quantity. In the after-grasses also the chicory was the only one productive.” From the whole of the experiment it appears, that the superiority of chicory, in general, over other plants in general is very considerable, which is a circumstance principally to be attended to§.

As a very large proportion of green food is afforded by this plant at a period

\* *Annals of Agriculture*, Vol. XX.

† *Ibid.* Vol. XVII.

‡ *Ibid.*

§ *Ibid.*



when it is not otherwise easily obtained, its uses in soiling cattle or other animals are evident.

In a comparative experiment of stall-feeding eight beasts with tares and chicory, it appears that, on putting to tares only, from May 25 to June 21, they gained  $49\frac{1}{2}$  stones; weighed again 6th July, gained 17 stones:—on this weighing they were put to chicory, the tares and that both being given to them; weighed again 13th July, only one week afterwards, and had gained  $27\frac{1}{2}$  stones, or an advantage of about 8s. 7d. per head per week\*.

Its utility for the purpose of pasturage is fully shown by other statements.

On an experiment being made with ten pounds of this seed over five acres, in a good strong wet loamy soil, sown with barley among clover, trefoil, rib-grass, burnet, &c., in order to remark in the pasturing whether sheep and cattle would eat it as well as those other grasses; it was viewed during part of three years, particularly in the first autumn, after the barley was cut, when a fine fleece of herbage was produced: the two following years it was mown by the farmer, and fed through the latter. It proved by the result that the chicory was always eaten by sheep, cows, and fatting bullocks, as close to the ground as any of the other plants. Though horses were in the field, no remark was made whether it was eaten by them; but in the stable soiling they ate it with avidity†.

Mr. Martin found it an excellent summer pasturage for store sheep, whether mixed with clover or alone, especially on dry soils and in dry summers, as from its tap root it receives nourishment from a great depth, affords a large quantity of food, and bears eating close without any danger of drought affecting it: it should always be eaten close. It may not be proper in feeding pastures, as fat cattle must have abundance of food; for in such cases it would send up the seed-stalks too much, and they would not eat it, and by its luxuriant growth it might damage the finer grasses‡.

On a *brashy* soil, the Duke of Bedford found that the produce of an acre sown with this seed, the first year supported seven new Leicester sheep, of about 22lbs. a quarter, for six months; and is of opinion that, on the same land, no other artificial grass would have equalled it§.

There are some other plants occasionally cut and used as a green food for cattle, such as:

*Beck Wheat* (*Polygonum Fagopyrum*)—a plant, the utility of which has been

\* Annals of Agriculture, Vol. XX.

† Ibid. Vol. XV.

‡ Ibid. Vol. XXVIII.

§ Ibid. Vol. XXVIII.



much extolled by some cultivators, while others have thought less favourably of its advantages: with good farmers it is however a valuable crop.

It is capable of being grown on most sorts of soil, provided they be sufficiently dry and in a tolerably fertile state; but answers best on those of the thinner kinds, especially where they are of a sandy nature.

In the preparation of the land it is less difficult than many other plants, being sometimes sown with success upon one earth. A fine clean state of tilth is however the best, as grass-seeds are mostly sown with it.

*Seed and Time of Sowing.*—The proportion of seed that is necessary in raising a crop of this sort is about a bushel to the acre; and it may be sown at different times, in the spring and summer season, as in May, and about the end of June or beginning of the following month. As it is a tender plant in its early growth, it should never be sown too early, so as to be in danger from frosts. It is generally sown in the broadcast method, being well harrowed in.

*After-management.*—As crops of buck wheat usually cover the ground well, there is seldom much attention necessary in their culture afterwards.

In the application of the crop, it is either suffered to remain for the purpose of seed, cut and used green for cattle, or ploughed under as a manure. In the first method, the produce is from four or five to seven or eight sacks\*, which is made use of in feeding horses, fattening hogs, and keeping poultry. If ground, it affords a white flour. In soiling cattle, it may be mown twice in the summer season. When given to milch cows, it is said to increase the flow of milk in a considerable degree. In feeding it down green by hogs, it has been found to produce an inebriating effect upon them†. The quantity of food that it affords in this mode of consumption does not seem to be well ascertained. The method of ploughing it under for the purpose of manure has been already noticed in speaking of manures: it is an excellent crop for sowing grass-seeds with.

When cultivated after tares, in Mr. Mosely's trials it was found to be highly advantageous as a preparation for wheat, preserving the land, after their removal, from the effects of the sun till the period of the wheat being put in. In Mr. Young's opinion, much is effected by this combination of crops: "a coat of manure is gained at no expense, the year carried through from Michaelmas to Michaelmas; and three crops put in, on three ploughings, viz. tares, buck-wheat, and wheat." It is not, he supposes, easy to form a more complete system‡.

In particular situations and circumstances, as where barley or other spring corn

\* Suffolk Report.

† Synopsis of Husbandry.

‡ Suffolk Report.



cannot be put in sufficiently early, the culture of this plant may be practised with great advantage. It ripens about October; in harvesting it, care must be taken that it does not shed.

It seems probable from some trials which have been lately made, that *winter barley*, as being extremely hardy and affording an abundant produce, may be grown with much more advantage as a green food for the purpose of foiling and the support of stock, than buck-wheat.

As we have already pointed out the sorts of land that seem most adapted to the purposes of tillage, it may here be necessary to say a few words on the proportion that ought to exist between the arable and grass land on the same farm.

It is evident that this must be much influenced by local circumstances and other causes, which have merely a relation to particular cases; and that they must vary in a great degree, according to the nature of the soil, the methods of management that may be adopted, and the quantity of stock that is to be kept. On clayey soils a much larger proportion should be kept in grass than on most others, especially when tenacious and not easily drained, as green winter food is scarcely to be obtained at all, or not without much trouble, difficulty, and expense: of course the working stock, and such a number as are kept for consuming straw and making dung, must depend in a greater degree on meadow hay than upon soils which admit of the turnip and cabbage culture. Clover, indeed, succeeds on clays, but is uncertain and liable to failure: consequently, without a certain resource in the hay of natural grass, much inconvenience must frequently be sustained.

In the experience of the Rev. Mr. Young they have been found, when in the proportion of one half, to be conducted in a more profitable manner than in a smaller proportion, and not to allow of being managed with advantage in less than one third under the state of sward\*.

In loamy soils, it is probable that a third or a fourth in grass is the proportion that may be most suitable, and the more they tend to wetness the larger the proportion. Grass is not, however, so necessary on these soils, as clover and other artificial grasses of the same kind are less liable to miscarry, and they admit the alternate husbandry of grass and grain in a more easy and profitable manner.

In the sandy sorts of land, there should probably be as little as possible in the state of grass: they are, perhaps, best managed when nearly the whole is under the plough, as by means of proper cultivated grasses, &c. the whole stock of the farm may be profitably supported, and the land rested sufficiently for ensuring a continued produc-

\* Communications to the Board of Agriculture, Vol. III.



tion of grain. But in opposition to this rule, and most unprofitably, large tracts, in many districts, are commonly withheld from the plough, under the name of barren heath land, &c. which by alternate tillage and rest would produce more grain, and keep more sheep than in the present state\*.

The different descriptions of calcareous soils may also be the most productive in a state of arable cultivation, or with but a small proportion of grass. In some of the south-western districts, from the farmers not being allowed by the land-owners to plough up down lands, too large a proportion remains in grass for admitting the most advantageous cultivation. However, the degree of fertility which they have in many cases attained, may in some measure justify the practice, on account of the support afforded to sheep stock in the winter†.

In peaty soils, from a great proportion of them seldom being in a state, for want of proper draining, fit for tillage, the arable should form a smaller proportion to the grass than in other case: it can, however, only be fully regulated by local circumstances.

But, besides these, the modes of application in which the lands are managed must have considerable influence in regulating the proportions which the grass should bear to the arable, as where grazing, dairying, or the making of hay are the principal objects of the farmer, the whole of the farms are mostly in grass. In the two first of these cases it is probable that the farms might be more profitably conducted by having a small proportion in tillage, as from a fourth or fifth to a tenth, according to the nature of the lands, and the extent of cattle and horses that may be kept; as by this means, not only straw for litter may be more conveniently obtained, but likewise green vegetables for the partial support of the stock, which must otherwise be often procured at great inconvenience and expense. In the case of hay farms, as they are mostly in the vicinity of large towns, it may, perhaps, in most cases, be better to purchase the straw than provide it by tillage, as little will be necessary from small teams only being required.

\* Communications to the Board, Vol. III.

† Ibid.



## SECTION XII.

## CULTIVATION OF GRASS LAND.

**GRASS LANDS**—Kinds of—Proper application of—Meadows and other Hay Lands—Difference of management in—Clearing from Stock—Times proper for in different cases—Removing obstructions to the Scythe—Coarse Weeds and Plants—Moss—Sticks—Stones—Cattle—Dung-hills—Ant-hills—Different methods of in each—Mole-hills—Catching and destroying Moles—**MANURING**—Proper times for—Kinds of Manure for—States in which applied with most benefit—Proportion of necessary—Repetition of—Some sorts used as top dressings cannot be often repeated—Chalk—Marle—Chopped woollen rags, &c.—Capable of being more frequently used in composts—Lime with vegetable substances often employed as top-dressings—Peat-ashes—Coal-ashes—Soot—Best applied after rain in March—Setting out manures—Attention necessary in—Mr. M'Donald's contrivance for—Spreading of—Bush-harrowing—Rolling—Modes of performing these operations—Proper times for—Methods of restoring grass-lands—**WATERED MEADOWS**—Nature of—Situations and soils proper for—Methods of forming—Spirit level useful in—Irrigation or Watering—Modes of conducting the process—Catch-work watering—Where capable of application—Circumstances to be attended to in—Utility often derived in watering from stirring mud in bottoms of mains, and the use of lime or other substances—Causes of the beneficial effects of watering—Vast utility of—Proper seasons for—Proportions of water necessary in different cases of—Lengths of time for continuing it—Mr. Wright's opinion of—Mr. Boswell's—Circumstances to be regarded in eating down watered lands—Useful in producing early grass—Mr. Temple's improvements by watering—Improvements by in Yorkshire—In Cheshire by Mr. Fenna—**WARPING**, a practice in Lincolnshire—Only slightly useful on grass-lands—**MOWING**—Proper periods for—Methods of performing—**HAY-MAKING**—Best methods of—**STACKING** and **THATCHING** Hay—Best methods of performing—Modes of preventing stacks heating—Stacking stages—Hay sweeps—**AFTER-GRASS**—Modes of management of—Mowing—Best application of produce of—Pasturing of—Utility of in this view.—**PASTURE LANDS**—Modes of management in—Removal of obstacles to Pasturage—Methods of improvement of—Different modes of application of—Modes of stocking and feeding down—Circumstances to be attended to in—**DRINKING-PONDS**—Utility of for cattle—Methods of forming of—Mr. Marshall's calculation of expenses of—Construction of by Mr. Billingsley—**COW-KEEPING**—Modes of management in—Cows proper for—Manner of foddering of—Times of milking of—Milk—Method of selling of—Profit of—**SUCKLING CALVES**—Methods of management in—Advantages of—**REARING CALVES**—Attention necessary in to have good live stock—Best methods of practice in different districts—**WEANING CALVES**—Attention necessary to wean early—Best methods of—Young stock should always be well fed—**DAIRYING**—Lands proper for different kinds of—Proper modes of conducting of—Convenient dairy-houses useful—Proper sorts of cows for—Must always be well foddered—Kinds of food proper for winter and summer—Times of milking of—Proper management of milk—Churning—Making butter—What necessary in these operations—Quantity of produce in—Cheese—Processes of making of—What necessary in the various operations of—Advantage of dairying in general—**GRAZING**—Lands most proper for—Methods of stocking of—Sorts of animals for in different cases of—Neat cattle—Sheep—Lambs—Systems of management in each—Horses—Hogs—Management in each—Advantages of—Produce of in different cases—**SOILING AND STALL-FEEDING**—Soiling—Vast advantage of in saving of food—What necessary to regard in—Methods of foddering employed in—Stall-feeding—Modes of management in—Kinds of food employed—Methods of feeding—Proportions of consumed—Advantages of different sorts of—**HOUSE-LAMB SUCKLING**—Convenient lamb-houses necessary for—Breeds of ewes proper in—Manner of feeding ewes in—Management in suckling-house—Advantages of—**PLANTING**—Cases in which useful—Soils adapted to—Kinds of trees proper for in different cases—**FRUIT KIND**—Apple—Pear—Sorts proper for cyder and perry—Soils suited to—Aspects most favourable for—Methods of planting—Proper



*distances for—Should not be planted too deep—Best seasons for—Methods of pruning—Causes of blights, &c. in—Manner of keeping the fruit for cyder—Process of making it—Produce in the apple and pear—Advantages of—TIMBER KIND—Soils proper for—Kinds of trees suitable for different cases of—Oak—Ash—Elm—Mountain-Ash—Beech—Sycamore—Fir—Larch—Poplar—Willow—Ozier, &c.—Best sizes of for planting—Manner of raising in the nursery—Preparation of land for—Distances at which planted—Manner of planting in different situations—In belts, stripes, clumps, &c.—Method of mixing the plants—Warmth necessary in raising—Methods of planting out—Should be kept clean afterwards—Filling up vacancies—Planting hedge-row timber—Trees larger in these cases—Proper pruning of—Methods of thinning in plantations—In underwoods—Oziers—Methods of planting and culture in—Profits of—Willow advantageous in some situations—Woods—Management necessary in—Causes of decay of—Modes of filling up—Times and methods of cutting over—In Buckinghamshire—In Worcestershire—In Herefordshire—In Staffordshire—Time of cutting over in underwoods—Manner of performing the work.*

**L**ANDS in the state of grass must obviously be applied to different purposes, according to their nature, situation, and other circumstances. Those which are of the more moist and wet kinds, whether from the nature of the soil or the peculiarity of situation, and which have been a long time in the state of sward, are for the most part kept under the scythe; while those of the contrary description, that are situated at a greater height, and of course, in most cases, possess a greater degree of firmness, are in general appropriated to the purpose of pasturage—though, in particular situations where grass land is scarce, and consequently of great value, they are likewise occasionally converted to the purpose of hay. As grass plants grow to the greatest height in situations where a considerable degree of moisture is constantly preserved, and of course afford the largest produce, it would seem that the practice of keeping moist lands under the scythe is right on this account, as well as that of their being less firm and solid in their texture, and their mostly producing a coarser herbage. The more elevated grounds, as they bear the stock generally with less injury, and often afford both a more fine and sweet feed, are with propriety converted to the use of being fed down by cattle and other animals. But by a suitable management in the feeding down, and use of manure, these sorts of land may even be brought to afford a considerable produce in hay.

The common meadow lands, from their being situated in the hollows and sloping sides of the valleys, where the staple and depth of soil of the lands have for a long time been continually increasing by the deposition of various sorts of vegetable and other matters brought down from the higher grounds, are however, in general, in a considerably greater state of fertility, and evidently better fitted for the permanent production of grass than those from which they have derived their richness. It has been well observed, that this sort of land of all others is the most productive of grass and hay, yielding sustenances for cattle through the summer and winter, and producing an everlasting source of manure for the improvement of the adjoining uplands; and



that in all cases of extensive inclosures, the improvement of the vale land, or that formed by nature for meadow and pasture, should be first attended to\*.

But as, from their greater retention of moisture, in consequence of their situation, and the depth of vegetable matter, they are liable to throw up coarse herbage in many cases, more drainage, as well as other management, is necessary to bring them into the proper condition for the growth of good herbage, than is requisite in the hay grounds in the more elevated places. And by a more particular attention in these respects they would, in many instances, be rendered a vast deal more productive than they are at present, and at the same time afford a much better and less coarse herbage. They would also admit stock upon them a much greater length of time, both in the autumn and spring seasons.

The most proper season for surface-draining grass lands is in the autumn, when they are somewhat firm and dry, as in the early spring months such lands are too full of moisture. The grips, or small open drains, should be cut obliquely, in the most suitable directions for conveying off the superficial stagnant water, the materials taken out being wholly removed. Much of this sort of draining may be performed at a small expense, and the beneficial effects be very considerable†.

Besides, such meadow lands demand much more attention in their management in other respects, as those of their being fed by cattle, and the performing of the different operations that are proper for rendering them productive of good herbage. In these cases stock should be turned upon the lands, and manures applied with much care, and only when the land is in such a state of dryness as not to be injured by the poaching in or breaking of the sward. The higher and more dry sorts of grass land, in most instances, admit of considerably more latitude in performing these different operations, as they are capable of admitting the stock, as well as the dung-cart, more early in the spring months, and of suffering them to remain to, or be applied at, later periods in the autumn, without inconvenience. The advantage of this attention is rendered sufficiently plain by the effects which the contrary practice produces in such meadow and other hay lands as are in a state of commonage, where the stock is admitted at all seasons and under all circumstances.

As it must be evident to the most superficial observation, that the breaking of the surface, texture, or sward of grass lands must in all cases be prejudicial, not only by the destruction of plants, which is thereby immediately produced, but also by the retention and stagnation of water upon them in the holes and depressions from small portions of the turf being forced in; the necessity and utility of clearing and removing all sorts of live stock, and especially those of the heavy



kinds, in both these descriptions of meadow lands, when intended for hay, becomes strikingly obvious. In a piece of clayey meadow land exposed to the treading of cattle during the wet season of winter, with the view of fully ascertaining the effects of the practice of suffering cattle to remain too long upon grass hay lands, it was found that after three years, notwithstanding every possible care and attention being employed in rolling, manuring, and sowing grass seeds, it was not restored to its former state of sward.

And it has been remarked that on the deep, tough, yellow, clayey grass lands, in Middlesex, every care is taken to prevent the least degree of poaching by cattle, as "it is well known that wherever a bullock makes a hole with his foot in this kind of soil, it holds water and totally destroys every vestige of herbage, which is not quite replaced till several years after the hole is grown up\*."

The exact period of performing this business cannot be easily regulated by any fixed rules, as it must always depend much on season: but it should never, on any account, be delayed after the grounds have become so much impregnated with moisture as to easily give way to the tread of the animals. In the autumn season the heavy cattle should perhaps seldom be suffered to remain on the softer sorts of lands longer than the beginning of November; but in those of the more dry kinds they may be let remain to the end of that month with safety. Sheep stock may however in the drier kinds be continued till February, or later. And, in the spring season, if pastured at all, they should not be admitted upon such lands till they begin to possess a proper degree of firmness; which will depend on the various circumstances of the preceding season. On the more low and moist sorts of meadow land it can, probably, seldom be ventured earlier than the middle of March.

But it is obviously a much better practice, especially where hay is the main object, not to eat them down at all, or very little, with cattle in the spring, and not so much, as is the usual custom, with sheep; as it is plain that by this means the cultivator will not only ensure a more abundant produce, but a much earlier one; and, of course, have more advantage in the making it into hay and securing the crop.

And, where the lands are fertile and the grass springs quickly, as is often the case near large towns, where manure is plentiful, it may be advantageous in the view of having a second crop; as by that means the after-grass may be cut more early, and be less in danger of being well secured. Besides, in all events, the after-math will be in a more forward state, and, of course, ready at a more early

\* Middlesex Agricultural Report.



period for the admission of stock of different kinds ; which, in many cases, is a circumstance of great importance to the farmer.

The most proper periods of shutting up such grass lands as are designed for hay must, like those of eating them down in the autumn by stock, depend on various circumstances that can only suit the particular cases. In general, however, it is the best practice not to delay it too long. When the lands are not eaten at all in the spring by cattle, after the sheep have been removed, about the middle of February, nothing further is allowed to enter the meadows ; by which means a quick vegetation is secured, as well as a more plentiful crop and a more early hay harvest \*. And in other cases it should probably seldom much exceed the beginning of April, as when eaten much later, especially in the southern districts, there is not time for the grass to produce a full crop before the commencement of the hay season : of course, the farmer sustains more loss than can be repayed by any advantage in the additional feeding he may obtain. This is therefore the best practice where the view of the farmer is hay ; and it should be particularly adopted and attended to in cow farms, where it is of much importance to cut early, and at different times, in order to secure hay of a fine, soft, grassy quality, for the purpose of producing large supplies of milk. In these cases it is cut two, three, or more weeks before the usual period, as it is found better not to let the seed-stems rise.

After the meadows or other grass lands have had the cattle and other sorts of live stock removed from them in the early spring months, and been shut up for hay, they should be prepared for the scythe, by having all sorts of obstructions picked up and removed. This work should always be executed as soon as possible, before the grass begins to spring up too much and conceal them, as it is difficult to perform the business effectually afterwards.

*Extirpating coarse Plants.*—It is an excellent practice, but one that is too much neglected by grass farmers in general, to have all sorts of coarse plants of the aquatic and other kinds, such as rushes, fern, docks, thistles, and various others, effectually drawn up and eradicated both from the hedge-rows and other parts of the fields, in order to prevent their running up to seed and disseminating themselves over the lands, and thus not only filling them progressively with all sorts of trumpery, but greatly injuring the herbage. In a field on an extensive hay farm in this neighbourhood, on perceiving the whole surface thickly studded with thistles, it was found that this sort of plants had been suffered to flower and perfect their seed

\* Middlesex Agricultural Report.



annually, till the lands on every side had become fully stocked, to the vast injury of the crops. The same thing takes place with the dock and several other noxious plants; which strongly enforces the utility of the practice just recommended. The annual expense of performing the business is but a mere trifle, while the advantage must be real and permanent. The saving to the farmer would be considerable by having the work regularly done as soon as the weeds fully show themselves, and, at the same time, his young hedge plants be prevented from being destroyed, by being shaded and choked up by so many weeds. In order to take them up in a perfect manner, a narrow implement of the spade kind, such as is made use of in forming narrow drains, may be employed with advantage, as cutting or breaking them off is by no means effectual. After such plants have been removed and the ground well cleaned, sowing the banks and hedge rows with the best grass-seeds, white clover, and other plants, might be an excellent practice; as, in this way, the lands may be improved rather than injured.

Plants of the rush kind may be easily removed by preventing the stagnation of moisture near the surface, by judicious under or surface draining, and the application of substances of the saline or calcareous kinds, such as ashes, lime, drift from the roads, and other similar materials. These are best made use of in a dry season, in either the autumn or spring; but the latter is probably the best, as these absorbent materials will thereby be made use of at the time such plants begin to shoot and establish themselves, and when there will be the least danger of their operation being lessened or prevented by too great a degree of moisture. It has been observed, that in naturally coarse meadows, or such as become so in consequence of rushes growing upon them before they have been rendered sufficiently dry by draining, it forms a great improvement to apply a thin coat of sand evenly over the surface of them, in the proportion of from twenty to thirty common loads\*. By this means the sward is rendered much finer, and a much better sort of herbage brought up; white clover being predominant in most cases.

There is another method that, in particular situations, may be more easy and convenient, and which has been found to quickly destroy plants of this coarse kind by bringing up those of a finer description. This may appear extraordinary at first to those who have not seen its sudden and astonishing effects in this way. It is that of conducting water over the surface of such grounds; but in this intention it should not be suffered to have the least degree of stagnation, but be conveyed off with as much expedition as possible by suitable drainage.

\* Kent's Hints.



*Moss.*—In particular cases there is another sort of plant that is apt to fix and establish itself upon the surface, as in old grass lands, both of the meadow and pasture kinds, that are of a clayey nature and situated in cold exposed districts, to the great injury and destruction of the natural grasses. This is that of moss, which is a vegetable that spreads and extends itself upon the surface, not only choking up, but depriving the grass plants of the nourishment that is necessary for their support and healthy growth. Various means have been proposed by writers on husbandry for the removal of this most destructive vegetable. But as it requires a considerable proportion of superficial moisture to promote its growth and extension on the soils which it infests, it is probable that the application of such substances as have a tendency to absorb and take up the superabundant degree of wetness by which it is supported, must be of the greatest utility and advantage.

In this view lime has alone been applied evenly over the surface, in such cases, with much benefit. We have, however, experienced superior advantage by covering mossy grass lands with a thin even coat of attenuated calcareous matter, in union with a sandy material, such as is scraped up from roads, when formed into a compost with about one-fourth part of well-rotted farm-yard dung; as by this application the growth of the old grass plants is not only rendered more strong and healthy, but a new and more vigorous description of grasses brought up which soon overpower the moss plants, and thus wholly destroy them. For the same purpose, and at the same time promoting the improvement of the lands, as well as bringing the herbage into a finer state, the penning or folding of sheep has been advised \*. In this practice advantage is obtained in different ways, as by the effect which the treading has in opening and removing the close netted texture of the moss, and that of the urine and dung in promoting the more strong growth of the grass plants. This method may probably be had recourse to with the most success either in the close of the summer season or early in the spring months: the latter is, however, to be preferred; as, from the grass immediately covering the surface, more effect may be produced in smothering and destroying the mossy vegetation.

Harrowing with short sharp-tined light harrows is likewise a practice that may be found useful in some cases, especially previous to the application of such substances or composts as have been just mentioned; as, by such means, the matted nature of the moss is broken down, and rendered more open and fit for admitting the manure to the roots of the grass plants, and exerting its full influence in promoting their vigorous growth, and, at the same time, the spreading of the moss in

\* Kent's Hints;



ome measure prevented. After such harrowings have been performed, some have recommended it as an advantageous practice to sow grass seeds, and especially white clover, over the surface \*.

*Sticks.*—As small portions of rotten or other sorts of sticks are frequently dispersed over the surface of grass lands, from the hedges and trees, by the winds during the winter season, they should constantly be raked together or picked up, and conveyed from the land at the time the ground is shut up for hay; as, where this is neglected, they afford much obstruction to the scythe, and render the work incapable of being performed in a complete manner.

*Stones.*—The removal of these is equally necessary with those of sticks, as they are not less injurious in impeding the progress of the mower: the practice of suffering such sorts of materials to remain blended with the manure, and set upon the lands with it, as is commonly the case in this as well as many other grass districts, is not less slovenly than reprehensible. It would be much more easy, and far less expensive, to separate them during the time the manure is turning over and preparing for its application; and thus the trouble, expense, and occasional neglect of having them afterwards picked off, would be avoided. When gathered up in the fields, they should not, as is too commonly the custom, be thrown together into heaps on the grounds, but be wholly removed, either into the gate-ways or other suitable places; as, when left in the heaps, they are not only liable to be again dispersed on the lands, but injure them by their remaining and bringing up coarse grasses.

*Cattle Dungbills.*—These are always necessary to be spread out as soon as the work can be conveniently performed after the stock has been removed; as the longer they are suffered to remain, the greater the injury the sward sustains by being made tender in the places they cover, and their preventing the natural grasses from rising, as well as bringing up coarse plants, in some cases, afterwards. In spreading the heaps, care should be taken to break them well, and disperse them as evenly on the surface as possible; as, where this is not done, from becoming hard they are apt to impede the scythe.

*Ant-Hills.*—Where grass-husbandry is perfectly understood, and the lands kept under a proper state of management, hills of this sort are seldom or ever met with: it is only where the lands have been neglected, or conducted under an improper system of cultivation, that they prevail either in meadow or pasture lands. From the greater degree of dryness in the latter sort of land, they are more frequently found in them, especially where the sward is old and mossy. Under circumstances



of the latter kind it may, in some cases, be a more advisable practice to break up the land altogether, than endeavour to remove the hills and destroy the insects. But in many instances they may be removed without this trouble, and the land be restored to the state of good sward. Two methods have been chiefly depended upon in bringing these sorts of land into proper order; which are those of cutting the hills over in cross directions, and hollowing out the internal mouldy part, and then laying the turfs down again, in an even manner, over the places where the hills stood, the earthy materials being afterwards chopped small and spread evenly over the land; and of paring them wholly off even with the surface of the ground, and depositing them in heaps, in proper places, that they may rot and decay, so as to become in a state of fine mould, and be mixed up with lime in the proportion of a third or fourth, according to the circumstances of the land, and then spread out thinly over the same ground. Both these modes may, probably, be practised with advantage under different circumstances; as, where the fields are in sight from houses, or otherwise much exposed to view, the former may be the more advisable, as rendering the ground less disagreeable to the eye; but under other circumstances the latter will be the most proper, not only as more effectually extirpating the ants, but as affording a more lasting improvement to the land\*. In either method, heavy and frequent rolling should constantly be had recourse to afterwards, as it is in a great measure from the want of this that the hills are at first produced. It is, indeed, rendered extremely probable by the fact stated below, that this practice may alone, in many cases, effectually remove this sort of hill. In the rolling down of ant-hills instead of cutting them up, in an experiment made by the Duke of Grafton, it was found to be attended with complete success. A large pasture which had been very much infested with ants, and which they had almost covered with hills, was perfectly restored by repeated heavy rollings†.

In these cases the rollings should be performed both in the autumn and spring seasons, when the lands are in such states of moisture as just to admit the impression of the roller without receiving injury from the feet of the animals. If such operations be executed when the grounds are in a state of considerable dryness, the benefits will be comparatively but small. The good effects that are produced in this process depend upon the degrees of consolidation effected; as it is only by this means that the insects can be prevented from carrying on their various operations; a certain state of lightness as well as fineness in the mould being essential to the complete execution of their labours.

\* Kent's Hints.

† Annals of Agriculture, Vol. XVI.



Other modes of destroying these insects, and preventing the formation of their hills, have been made use of. As the economy of the ant requires the situation and soil to be dry and friable, in order to carry on their works, it is probable that, in lands that will admit of the practice, it may be an easy and convenient method of destroying them, and preventing the bad consequences which their labours produce on the surface sward, to conduct water over them; and thus, at the same time, exterminate the colonies of ants and irrigate the ground; by which two improvements may be effected at once,—the land being cleared from ant-hills, while its fertility is considerably increased.

The use of night soil, in composition with various sorts of earthy materials, has been recommended with the intention of destroying such insects; but we suspect that it can only be effectual in cases where they have not attained any great height.

*Mole-Hills.*—In the more rich and fertile soils, hills of this sort are frequently thrown up in great numbers, from their abounding more with the food of the subterraneous animals that produce them. Meadows are often extensively and seriously injured in this way. On account of their depth of soft humid soil, moles usually reside, destroy, and render useless the grass, not only of the very spots where the hills are raised, but likewise to some extent immediately round them, as well as by impeding the free course of the scythe: for these reasons the extermination of moles becomes an object of great consequence to grass-husbandry.

In the early spring months, when such hills are in a tolerably dry and powdery state, no time should be lost in spreading them out, and dispersing them in as even and regular a manner as possible over the surface of the sward that adjoins them; as, when they remain long without being scaled, they do considerable injury to the grass plants underneath them, by blanching and rendering them tender. This business may be very conveniently performed by a common iron-toothed garden rake.

But it is invariably the best method never to suffer the animals to remain in the land, but to procure an expert mole-catcher to destroy them, and thus wholly prevent the hills from being thrown up.

The mole is a subterraneous inhabitant, whose health will not bear the free access of the air for any great length of time, seldom coming upon the surface except for the purpose of changing its habitation: its food is worms, subterraneous insects, or the roots of plants, and it is supposed never to drink: it is, as has been just noticed, most prevalent in fertile soft soils, avoiding clayey or gravelly grounds; and on the introduction of water into its recesses, it immediately makes its escape to the surface;



yet it has been observed to swim across water \*. During wet seasons it betakes itself to the upper and less humid lands, returning in the spring to the soft mould of the meadows, where it can easily perforate and find plenty of food. The breeding season of this animal are the months of February, March, April, and May, producing generally four or five at a birth. The constant employment of the mole is to make subterraneous tunnels, which are usually parallel to the surface, at the depth of from four to six inches; but when intimidated, it will penetrate a foot deep for security. In the formation of these passages the mole-hills are raised; a mole on changing its abode generally throwing up from four to nine of these hills, the passages communicating with each of them. These few circumstances, concerning the natural history of the mole, may in some degree serve to direct the operator in the best and most ready means of catching, or otherwise destroying, such animals.

In order to destroy these animals, it has been recommended to inject the smoke of burning sulphur and tobacco into their subterraneous retreats. However, as the earth frequently falls in behind them as they pass, or becomes accumulated as they perforate the ground, this method of destroying them can seldom be effectual, unless the nest of the animal be near the aperture through which it has been fumigated. Water has also been advised to be poured into their holes, which is seldom more efficacious, though it may have had effect in particular cases. Baited traps have likewise been tried, but with little better success.

On the authority of an experienced mole-catcher in Nottinghamshire, the following method of destroying these animals is described by Dr. Darwin:—"Moles have cities under ground, which consist of houses or nests, where they breed and nurse their young: communicating with these are wider and more frequented streets, made by the perpetual journeys of the male and female parents, as well as many other less frequented alleys, or by-roads, with many diverging branches, which they daily extend to collect food for themselves or their progeny." They are more active in the vernal months during the pairing season; more numerous burrows are therefore at this time made in the earth for the purpose of meeting with each other; and though they are mostly considered as blind, they appear to have some perception of light even in their subterraneous habitations, as they begin their work as soon as it is light, and of course before the warmth of the sun can be supposed to affect them. On these principles, this mole-catcher's method consisted first in attending their situations early, before sun-rise, as at that time he could frequently see the earth move over them, or the grass upon it; and with a small spade cut off their retreat by

\* Darwin's *Phytologia*.



striking it into the ground behind them, and then digging them out. By laying the ear to newly raised mole-hills, the noise of the scratching was sometimes heard at a distance, so as to direct where to find them; from the solid earth conveying slight vibrations of sound better and to a greater distance than the light air. A terrier dog, after being accustomed to this business, was also often found of service, in detecting, by his nose, the abode of the mole beneath the soil, showing it by beginning to scratch the earth above it.

As it has been observed that a mole mostly "suckles four, five, and sometimes six young ones, placed considerably deeper in the ground than their common runs; and as these nests are sunk much deeper into the ground than their streets or by-roads, and the mole-hills consequently larger; the earth on the summit of those hills is generally of a different colour, and is raised higher than that of the others. These nests are to be dug up, having first intercepted the passage between them and the mole-hills in their vicinity to cut off the retreat of the inhabitants. The next important circumstance is to discover which are the frequented streets and which the by-roads, for the purpose of setting subterraneous traps: this is effected by making a mark on every new mole-hill by a light pressure of the foot, and on the morning by observing whether a mole has again passed that way and obliterated the foot-mark; and this is to be done two or three successive mornings. These foot-marks should not be deeply impressed, lest it should alarm the animal on his return, and he should form a new branch of road, rather than open the obstructed one: the traps are then to be set in the frequented streets, so as nicely to fit the divided canal. They consist of a hollow semicylinder of wood with grooved rings at each end of it, in which are placed two nooses of horse-hair, one at each end, fastened loosely by a peg in the centre, and stretched above ground by a bent stick: when the mole has passed half way through one of the nooses and removed the central peg in his progression, the bent stick rises by its elasticity and strangulates the animal. As it was found that where the soil was too moist or tenacious, the moles in passing the old runs sometimes pushed a little of it before them, and thus loosened the central peg before they were in the noose, the peg in such cases was fixed a little faster in the middle of the trap." This method was pursued with great success.

*Manuring Grass-Lands.*—In order to preserve meadow and hay lands in the most suitable condition for the production of plentiful crops of grass, as well as to alter and improve the nature of the herbage, the occasional application of manure becomes necessary; as by this means the staple and depth of vegetable mould are not only much increased, but the land brought into such a state of fertility as that it



may afterwards be kept up with much less expense and trouble. It is a circumstance well known to grass farmers in the best cultivated districts, that when lands of this sort are suffered to get much out of condition, it is a much more difficult business to restore them to the proper state of productiveness, than to preserve them in it. From the constant decomposition and decay of various vegetable materials on the surface of grass lands, new portions of vegetable mould are constantly added, that improve the quality of the lands, and at the same time afford a more suitable and fertile bed for the establishment of the different kinds of grass plants. It is chiefly, perhaps, on these accounts that old grass lands are superior to new ones, and it explains the reason of the greater utility of earthy composts with dung in the latter than the former case.

There has been much difference of opinion in respect to the most proper periods of making such applications; but it is obvious that it should be regulated by circumstances of different kinds; such as the state of the land in regard to dryness, the peculiarity of its situation, the heat of the season, and the nature and condition of it in respect to soil and fertility. Where the nature of the lands is such as not to admit the dung-cart in the early spring months without the danger of injuring the surface by poaching or breaking the texture of the sward, the most proper season would seem to be in the beginning of the autumn, before the heavy rains fall, as at this period the manure may be laid on with the greatest convenience and safety; and from the after-grass being chiefly fed down with the least loss in that respect. Some, however, recommend this operation to be performed immediately after the land has been mown and cleared from the hay; and in this method there may be an advantage in some cases, as the growth of the after-grass may thereby be rendered more full and abundant. But on other accounts it must often be not only inconvenient, but uneconomical, as, from its happening at a season when much other business is to be performed, it can seldom be attended to in such a manner as is necessary; and when the season at this period is hot, and there is much sun, as in general is the case, there must be considerable loss sustained in the extrication and dissipation of the finer and more enriching particles, such as become more immediately the food of plants from their being in a condition nearly suitable for being absorbed and taken up by the roots of the grasses. The extent of the loss incurred in this way is much more considerable than is commonly supposed, as must appear evident from the great exhalation and constant evaporation that is often kept up for many days, or even weeks, as the very offensive smell that issues fully proves. In this district, where we have occasionally witnessed the practice, with some of the less intelligent farmers, the moisture of the manure has been so much forced off and



dissipated, especially when there is much wind, as to leave the materials in nearly a perfectly dry state. The sudden drying up of large ponds, at such seasons shows in a more striking manner the extent of the injury that the farmer sustains in choosing this season for the application of his manure.

Besides, there is another way in which a vast loss of manure may take place when applied at either of the periods that have been just noticed, especially where the lands lie in sloping directions, as is frequently the case, which is by the heavy rains in the autumnal season carrying down the more fine and rich parts of the manure, in a state of solution, into the ditches and runlets on the sides or other parts of the fields. Of the great waste of manure occasioned in this way any one may convince himself, by attending to the state of the water as it drains off from the higher grounds into these places, after the land has been previously dressed, as it will be found highly coloured, and loaded with the enriching carbonaceous particles of the manure. After frosts when sudden thaws occur, the same thing happens\*.

In situations that will, from the natural dryness and composition of the soils, admit of the practice of applying the manure in the early spring months, there will be less risk of waste in these ways, and at the same time more advantage obtained in the growth of the produce; as from the moderate heat and quickness of the vegetation at this season the grass will soon cover over and conceal the dung, when applied in a proper state of reduction, without suffering much exhalation to take place; and the enriching material be conveyed to the roots of the grass plants at the season in which it can be the most useful in promoting their growth. Where quantity of produce is the principal object, and the nature of the soil will admit of the manure's being applied without injury, this is therefore unquestionably the most proper as well as most beneficial time of putting the dung upon grass lands. The earlier, however, it can be performed in the season the better, as has been already more fully explained†.

An agricultor of much experience and observation has, however, found manure to produce the strongest effects upon the land when applied early in the autumn, or in meadows as soon as possible after they have had the hay taken off from them‡. Others, likewise, suppose this last as the most proper season for the business§.

There is scarcely any sort of manure that will not be useful when laid upon the surface of grass lands, but in general those of the more rich dung kinds will be the most suitable for the older sorts of sward land; and dung in composition with fresh vegetable earthy substances the more useful in the new lays or grass lands, as by this

\* Section on Manure.

† Ibid.

‡ Dr. Wilkinton in Communications to the Board of Agriculture, Vol. III.

§ Rev. Mr. Younk in Ibid.



means a fine vegetable soil will be prepared for the roots of the grass plants to shoot and spread themselves into, and consequently a better sward formed. But the most suitable sorts of applications in these cases have been described in considering the most proper management of such lands as have been newly laid down to grass.

In this district, where grass husbandry begins to be tolerably well understood, it is the practice of the best farmers to prefer the richest dung they can procure, and seldom to mix it with any sort of earthy material, as they find it to answer the best in respect to the quantity of produce, which is the principal object in view; the cultivators depending chiefly on the sale of their hay in the London markets. The lands on which this practice is pursued are mostly such as have been under the state of sward a considerable length of time, and the soils chiefly of the more tenacious loamy or clayey kinds. There cannot, however, be any doubt, but that earthy composts in the proportion of a third or fourth may in many cases, according to the nature and circumstances of the land, be applied with great and very beneficial effects, both in rendering the land more fertile and productive, and in bringing the herbage into a better state, as well as for improving the surface for the scythe. The sorts of substances that may be the most beneficially employed in this way have been fully described in speaking of manures.

But, whatever the material may be that is employed in compost with dung, or the nature of the manure, they should invariably be brought into a considerable degree of reduction. It is the practice in this district to turn over the dung that is brought from London in a tolerable state of rottenness, once chopping it well down in the operation so as to be in a middling state of fineness when put upon the land. It is necessary, however, that it should be in a more rotten and reduced state when applied in the spring than when the autumn is chosen for the purpose\*.

The proportion of manure that is necessary must in a great measure depend upon the circumstances of the land, and the facility of procuring it. It should in general be such as to afford a good covering to the whole surface of the ground. In this district, where the manure is of a very good and enriching quality from its being produced in stables and other places where animals are highly fed, the quantity is usually from four or five to six or seven loads on the acre, such as are drawn by three or four horses in their return from town on taking up the hay. But where the manure is of inferior quality, there may be a necessity for a much larger proportion†.

In regard to the frequency of dressing grass lands, it must obviously depend upon a variety of other circumstances, as well as that of the convenience of the farmer,



and the means he has of providing it. But so far as it respects the soil, it should, on the principles laid down above, constantly be performed at such distances of time, as that the fertility and condition of the land may not be suffered to decline, but be kept up and preserved in an equal or increased state of heart. In this intention the manner and frequency of cutting, or otherwise consuming the produce, must be attended to; as, where crops are more frequently taken off, the land must be prevented from being injured, by the great loss of fertility that must arise in this way, by the dressings being applied at shorter intervals, or in larger proportions at a time.

On meadow or grass lands that are in a proper state of cultivation, its being applied every third year may be sufficient; but on such as are of inferior value, every second year may be a better practice, as the lands by this frequent application of manure may attain a gradual improvement; whereas, in the other case, they would be on the decline, and in time become poor and exhausted.

It is a too common practice, in districts where grass, husbandry is imperfectly understood, to almost wholly neglect the manuring of their sward lands, in order to employ it on those that are under the plough: but this is evidently a bad and disadvantageous method for the cultivator; as it is only by the raising of abundant crops of grass for the purpose of being converted into hay, and of suitable kinds of green crops for green food, that an abundant stock of cattle can be kept, and the largest proportions of manure supplied.

There are some substances employed in the way of manure, as top-dressings to grass lands, that cannot be frequently repeated with either safety or advantage. Chalk, marl, chopped woollen rags, and some other similar materials, are of this kind. The first of these kinds, especially when of a soft unctuous nature, so as to readily fall down in the state of solution to the roots of the grass plants, is found to produce the most beneficial effects, in rendering the lands more fertile and productive, and improving the quality of the herbage. It cannot, however, be often repeated in its simple state with advantage, as it is some time in producing its full effects; but in that of compost, it may be applied with success at shorter intervals. Marl is likewise a substance, especially when it is of the rich soapy kind, that may be made use of with much advantage as a top-dressing on grass lands; but as its operation is slow, it cannot be repeated at short intervals, except when employed in the state of a compost with dung. Woollen rags, when rendered small by being chopped into pieces, may be laid on land in the state of sward; but as they require a considerable length of time to sink down and become mixed with the soil, so as to be well covered by the grass, they cannot be repeated at short intervals. After



they have been fully incorporated with the land, their beneficial effects are considerable, as have been shown by the trials of different cultivators.

There are several other materials that are occasionally used as top-dressings on grass lands; such as lime in combination with rich vegetable earth and with peat, the ashes derived from the combustion of peaty substances, coal ashes, and soot. All these have been made use of with good effects when thinly spread out over the surface swards of lands in the state of grass, as has been already sufficiently shown\*. The three last have been found to produce the best effects in being dispersed over the new lays of the artificial grass kinds. All applications of this sort should be applied about the beginning of March, being spread over the surface as evenly as possible. If it can be done before a shower of rain it will be the better, as it is of advantage to have them carried down to the roots of the grasses as soon as possible after they are laid upon the land.

In the putting of manure upon lands of this sort, some attention is necessary not to suffer too much to be placed out in any of the heaps, but to have them set out as much as possible in not too large equal proportions, and at regular distances from heap to heap; as, where the contrary is the case, it not only takes up more time, and causes much more trouble to the labourer in spreading them, but does not admit of the work being performed in so regular or so exact a manner. Besides, when the heaps are set out too large, more injury is done to the grass plants on the surface where they stood, if not soon spread out; which should always be the case. The carts employed in many districts for setting out dung in heaps are by no means convenient for the purpose. In this neighbourhood this sort of business is far from being well executed, except where small carts are in use. From the large ones commonly made use of, the heaps are apt to be set out not only very unequal in size, but much too large, and there is considerable trouble in conducting the work. In many other districts, carts for the purpose are in general use, and constructed so as to render the labour more easy and convenient.

A very ingenious contrivance to facilitate the unloading of carts filled with dung, or other sorts of manure, is mentioned by the author of the Perthshire Agricultural Report, as in use by Mr. M'Donald. This improvement consists in the box of the cart being suspended at different heights; but can only be employed with advantage in carts constructed on a moveable frame, or what are usually called *coup-carts*, and where the load is to be discharged in several portions or heaps. A thin piece of iron

\* Section on Manures and After-management of New Lays.



of about two inches in breadth being fixed on the fore part of the box of the cart, exactly in the middle, extending in length to the top of the box, in which are inserted three or four oblong holes, in size corresponding to a rod, which is fixed with a staple in the middle of the first bar that keeps the shafts together: the length of this rod is about 18 inches, or longer if necessary, as the height or length of that part of the box resting on the frame may require. The top of the rod is formed into the shape of a crescent an inch wide, with the points upwards, which corresponds with the holes in the plate. When the rod is not in use, it is made to rest on a hook in the front of the box, to prevent its dangling. When the driver wishes to unload his cart, he raises the box, putting the rod into the first nick, and makes the first heap, and moves on to the place where he intends to put down the second, again raising the box to the second nick, and so on till the whole is discharged.

In the spreading out of all sorts of materials on the surface of grass lands, it is necessary to see that the business be performed in an exact and even manner, and that all the clods and lumps be well broken down and perfectly reduced by beating with the fork or shovel. If possible, a dry season should be chosen for this sort of work, as, under such circumstances, it can be executed in the most regular and exact method. When the weather is wet it is an operation that can never be well performed, as the materials clog round the feet and tools of the workman, and can never be effectually separated or divided so as to spread out with the necessary degree of evenness. After the heaps have been set out, they should not be suffered to remain so long, as is often the case, before they are spread out, as the plants underneath them become blanched and tender, and great injury is done to the sward in such cases, all of which may be easily avoided by spreading as soon as possible after the manure is taken out. Inconveniences of this sort may likewise be avoided by spreading the manure from the carts, as is the practice in the midland and some other districts; but in this method we suspect the work can neither be executed in so exact a manner, or with so much economy of time to the labourer. In this way hill-steads will not however be formed, and, of course, the disadvantage of their getting too large a proportion of the manure prevented\*.

*Bush-harrowing.*—When the whole has been spread out, and remained in that state for a fortnight or three weeks, or longer, according to circumstances, and the whole is become in some degree dry and pulverizable, a bush-harrow should

\* Marshall's Midland Counties, Vol. II.



be passed over the surface once or twice in a place, as may be necessary, in order to reduce the manure into a finer state, and apply it more fully to the roots of the grasses. This operation, like that of spreading, should never be attempted when the season is wet and the manure in a cloggy adhesive state. When this work has been finished, all the rubbish of every kind should be carefully picked off, in order that the ground may receive the impression of the roller.

*Rolling Grass-Land.*—This is a process that is of considerable utility in the management of grass lands, especially such as are under the scythe, as without it they are often liable to become hilly and uneven, as well as the grass in some cases to become tussocky, or rise in large tufts. The impression of the roller not only renders the surface more fine and level, but at the same time induces the grass plants to spread more laterally, and in that way to form a better and more close sward. Its importance on new laid down grass lands is therefore extremely obvious; as it must be highly serviceable in these different intentions. The worm-casts are by this means reduced and brought into order, by which means the mowing can be performed with greater facility and in a closer manner. Besides, it may be useful in other views, as by pressing the mould, as well as the manure, more closely round the roots of the grass plants; and in consequence of such means they may not only be better established in the soil, and their vigorous growth more effectually promoted, but, from the moisture being more fully preserved in the ground, be in less danger of injury from the effects of heat in the summer months, and of course better crops be afforded.

On grass land the work of rolling may be advantageously performed at different seasons, as in the beginning of the autumn and in the commencement of the year, or the very early spring months; but the latter is the most common period. But in order to its being executed with the greatest possible benefit, a time should always be chosen, if possible, when the ground is in a suitable state for receiving the impression of the implement. In the drier descriptions of land it may frequently be performed in the most beneficial manner after the land has been rendered a little soft by a moderate fall of rain; but in those of the contrary sort it may be necessary to wait till the superabundant moisture be so much dried up as to admit the animals employed in drawing the machine without poaching, or otherwise injuring the surface of the ground.

A roller of considerable weight is necessary in performing this business in the most complete and effectual manner, such as has been already described\*. And in

\* Section on Implements.



order to prevent as much as possible the ground from being injured by the feet of the animals that draw it, as may frequently be the case where they follow each other in the same track: it may be the best practice to have them yoked double, as by that means there will be less treading on the same portion of surface. Where two horses are sufficient to execute the work, more should never be made use of; but if a third should be found necessary, it may be attached as a leader in the middle before the other two: a greater number of horses can seldom or ever be of any material advantage in this sort of work. It is necessary to be very careful in executing this operation, to see that every part receives the due impression of the implement. On lands where this sort of work is regularly performed, it will seldom be requisite to pass more than once in a place, but in other cases it may often be done more frequently with benefit.

The rolling of watered meadows should be executed towards the latter end of February or beginning of the following month, after the land has been left in a dry state for a week or ten days. The work should be performed lengthways of the panes, going up one side of the trenches and down the other\*. And in rolling the common hay lands, it is a good method to proceed up one side the field and down the other somewhat in the same manner.

As grass lands, especially those that have not been long restored to the state of sward, are sometimes liable to become thin and patchy, it may be necessary to restore or bring them to a perfect condition of surface, by sowing fresh grass seeds over the patches or uncovered parts. This is best performed as early as possible in the spring season, during moist weather, the seeds being either left to themselves, or trodden in by folding sheep thinly upon them. The roller may likewise be useful in this view by being run over the patches, though not so effectual as that of sheep. In this, as well as other cases, such sorts of grass seeds should be chosen as are the most adapted to the nature of the lands. Scarifying, or cutting the surface of grass lands by harrows or other implements set with coulter, has been lately practised, but not yet so fully as to ascertain its utility. It proceeds on principles contrary to those of rolling in the autumnal season.

*Watered Meadows.*—There are frequently extensive tracts of grass land, that from the nature of their situations are capable of being covered occasionally with water, from the rivers, brooks, or small streams, that flow through or near to them, and in this way admit of being improved and kept in a constant state of fertility and productiveness, without the trouble or expense of other sorts of manure.

\* Roswell on Water Meadows.



The greatest improvements in this way are effected, and the expenses of performing them the least, in those places where the current or descent of the streams is the most rapid\*.

\* The Implements made use of in conducting this sort of business are, according to Mr. Boswell, the following:

*Water Levels.*—Many of which are in use and are well known. The *Spirit level* is probably the best for this purpose. But in this work the labourers often dispense with the use of such instruments, bringing the water after them to work by. In forming a *main*, he says, they begin at the head, and work deep enough for the water to follow them; and in drawing a *tail drain*, they begin at the lower end of it, and work upwards, to let the tail water come to them, as this method gives the most exact level.

*Line, Rules, and Breast Plough.*—These are well-known implements; the last being mostly used in cutting turf for the sides of the cuts.

*Spades.*—In those used in this work the stems are considerably more crooked than in any other spades; so that the workman in the bottom of the ditch is able to make his drain or trench smooth and even, when standing in a working position. The bits are made of iron, about a foot wide in the middle, terminating in a point, having a thick ridge down the middle, and thin and sharp on the edges: when become thin and narrow by wearing, they are used for the smaller trenches.

*Crescent.*—This is an implement similar to a gardener's edging knife, but larger, very thin, and well steeled, having a stem about three feet long, with a cross handle to bear upon. Its use is to trace out the sides of the mains, trenches, drains, &c.

*Wheel-Barrows.*—For this use these are made *open*, without sides or hind part; they serve for conveying fods, &c.; for embanking, damming, &c.

*Hand-Barrows.*—These are likewise in use for the same purpose where the ground is soft and flooded.

*Three-wheeled Carts.*—These are made use of for different purposes, and have broad rimmed wheels. As the wheels do not follow each other in the same track, and as the weight is borne more equally, they are less subject to cut and sink into the soil.

*Scythes.*—Short and narrow ones are in use during the running of the water, to cut away the weeds and superfluous grass.

*Forks and Crooks.*—These are wanted when it is necessary to clear the drains of weeds and roots. The crooks are formed with long tines for this purpose, similar to dung-drags, and should be made light, and with long stems, so that the workmen may reach into deep water with them to clear obstructions.

*Stout Boots.*—These should have tops to draw half way up the thighs or more. They should be formed of stout leather, well greased with tallow, so as to resist running water for ten or twelve hours, and should be large enough to admit of stuffing them down with hay all round the legs.

The Terms employed in the art are thus explained by irrigators:

*Sluice.*—This differs from a wear simply in respect to its having but one thorough; for if there be more thoroughgs it then becomes a *wear*. It applies in a small stream in the same way as a wear does in a large one.

*Trunk.*—This is a covered sluice, and is so constructed in all cases where two streams of water are to cross each other at the point of discharge, or if it is to serve as a bridge.

*Carriage.*—A small species of wooden or brick aqueduct, built open, for the purpose of carrying one stream over another: this is the most expensive conveyance belonging to watering.

*Drain Sluice, or Drain Trunk.*—Such as are placed in the lowest part of a main, as near to the head as a



The most suitable soils for being watered are those that are of a sandy or gravelly friable nature, as the improvement is not only immediate, but the effects more

drain can be formed, and situated low enough to drain the main, &c. It is placed with the mouth at the bottom of the main, being let down into the bank; and from its other end a drain is cut to communicate with some trench-drain that is nearest. It is a contrivance used to carry off the leakage through the hatches when they are shut down, to convey the water to other grounds, or to repair the main, &c.

*Hatches* are floodgates, and applied to the same purposes: they are, of course, variously constructed. A particular kind, which have about a foot, to take off, so as to permit the water to flow over that much of the hatch where it appears to be useful in irrigation is a very good sort.

*Head Main.*—This is that part of the principal ditch which takes the water first out of a river or stream, for the purpose of distribution through its smaller ramifications.

*Small Mains.*—These are the next gradations of ditches applied to distribution, by means of their communication between the head main and trenches.

*Trench.*—The last distribution ditch in watering, continuing to decrease its dimensions as it spreads the water over a greater extent of ground.

*Trench Drain.*—A deep ditch, or drain, which meets the trenches for the purpose of taking the water away speedily after the irrigation is performed. It should be cut parallel to the trench, and as deep as the tail-drain water will permit, if possible so as to reach the stratum of sand, gravel, or clay. Its gradations are exactly the reverse of the trenches, which it meets in the manner of two forks placed with their points into each other at regular distances. Its parts, of course, increase as it receives successive streams to be drained off.

*Tail-Drain.*—The principal ditch which conveys the water out of the meadow. It receives that which all other drains discharge, and should consequently lead to the lowest possible point of discharge, and the nearest direction which the ground under every circumstance will permit. When used as a fence-ditch it answers a double purpose.

*Pane.*—Signifies the part of ground containing the grass to be mown between the trench and trench-drain.

*Way-Pane.*—The strip of land left for cartage along the side of the main, being watered from the banks of the main, and drained by a parallel ditch.

*Bend.*—A stoppage made in various parts of those trenches which have a too quick descent, in order to check the water and force it out of the trench. This is done by having small dams of the natural sward at proper places, and cutting a sod out of them wedge-ways, so as to stop the current and give a more equal distribution to the water.

*Gutter.*—A small groove cut from the tails of the trenches occasionally, to distribute the water to the utmost extent of the panes more equally than by the regular works.

*Catch-Drain.*—An occasional ditch which is sometimes cut to carry the same water into a second main, for the purpose of irrigating a lower meadow, or pane, with the same water which has been used.

*Pond.*—Is applied to any spot of stagnant water which is left on the ground in the process of irrigation.

*Turn of Water.*—As much as can be distributed at a single operation by the management of the hatches within the reach of the labourers employed, and as the stream will support.

*Head of the Meadow.*—That part into which the main first enters.



powerful than on other sorts of lands. Some strongadhesive four wet lands, such as are common in the vicinity of large rivers, are also capable of being improved by watering; but the beneficial effects are not in these cases so soon produced as on those of the above kind, nor is the process so advantageous to the farmer, on account of the very heavy expense to which he must, in many cases, be put by previous draining. Such lands as contain coarse vegetable productions, such as heath, ling, or rushes, may also be greatly improved in this way. There is another circumstance in regard to the different soils that may be benefited by irrigation, which is, that the more tenacious the soil is, the greater the command of water ought to be.

A stream capable of watering fifteen or twenty acres of light dry land, would be found to be beneficial in but a small degree if applied to watering half the same extent of cold clay soils, such as in their natural state abound with rushes. All soils of the last sort require a considerable body of water for the purpose of floating them, in order to produce much effect. If this cannot therefore be procured, such means of improvement will seldom answer the farmer's expectation, or turn out to much account.

Those grounds which admit of being benefited in this way with the most success are such as lie in low situations, on the borders of streams or rivers, or in sloping directions on the sides of hills, to which water can be conducted in the manner directed below.

It is necessary, before entering upon works of this kind, to consider, whether the stream of water to be employed will admit of a temporary wear or dam to be made across it, so as to keep the water up to a proper level for covering the land without flooding or injuring other adjoining grounds; or if the water be in its natural state sufficiently high without a wear or dam, or to be made so by taking it from the stream higher up more towards its source, and by the conductor keeping it up nearly to its level till it comes upon the meadow or other ground. Further, if the water can be drawn off the meadow or other ground as rapidly as it is brought on\*. Besides these, having attended with care to all such other difficulties and obstructions as may present themselves, from the lands being in lease through which it may be necessary to cut or form the *mains* or

*Tail.*—That part where the water last passes off by the tail-drain into the natural river, or sewer; or where that sewer itself leaves the meadow.

*Upper Side of a Main.*—That which, when made at nearly right angles to the river, fronts the point at which the river enters.

*Lower Side.*—The reverse of the above.

*Upper Pane.*—That which lays above the main, if such be left.

\* Wright on Floating Land.



*grand carriers*, from the water being necessary for turning mills, from the rivers or brooks not being wholly at the command of the irrigator, and from small necks of land intervening, so as to prevent the work from being performed to the greatest advantage, the operator may be in a situation to commence the business of irrigation.

This is to be done by the use of a *spirit level*, beginning from the highest part of the land that the stream can be commanded from, where the grounds on the different sides are the property of the same person, and weirs or other works, as has been just observed, can be carried across the streams for the purpose of forcing the water, either wholly or in a partial manner, into a different course. After it has been raised as high as possible in this way, the level is to be formed from the surface of the water, carrying it on what is termed the *dead level*, and marking it out, at certain distances, by two rows of sticks or stakes well driven down, one on the line of the dead level and the other opposite to it, at such distance below as may be sufficient to allow for the proper flowing of the water: a few inches in the mile will be sufficient to draw it; but from a foot to a foot and a half or two feet in that length may be requisite to afford a proper fall; and where interruptions present themselves, from buildings or other causes, a still greater fall will be necessary, in order that the passing of them may be provided for in a gradual, not a sudden, manner. It is proper to proceed in this way to the extent of the land that is capable of being watered. And when necessary, the level on the land upon the other side of the stream may be set out in a similar manner.

After this has been done, the land on the different sides of the stream, below the lines set out by the level should be minutely examined and inspected, as the whole may be irrigated if the command of water be sufficient. The extent that can be properly performed must, however, depend much on the degree of fall or descent from the entrance of the water and its out-fall, as well as on the declination of the more elevated parts of the ground. It, however, generally happens that a much greater space of land can be covered with water than was at first supposed.

The next circumstance of importance is that of deciding where to commence the business. This must depend on various points, which can only be settled by the judgment of the operator. If there be a full supply of water, the whole should be covered; but in the contrary case, the expense of cutting the mains or carriers on such levels in a sufficient manner should be considered; and where one side of the stream is better adapted to the purpose than the other, that on such side should be the first executed. And if the land most adapted to the purpose of watering be at much distance from the place whence the water is first taken, and there is not a



supply for the whole of the land below the line of level on one of the sides, the expense of forming the carrier should be put in comparison with the greater advantage of irrigating the most suitable grounds, in preference to others that are nearer, without possessing equal advantages. It mostly happens that the beneficial consequences of irrigating at command are such as to overbalance that of forming the mains or carriers. Besides, though the supply of water may be insufficient in such seasons as are very dry, as it may be abundant in the winter time, the simply covering the land at that period may be more than adequate to the expense of the business; which is a circumstance that may render it more beneficial to lengthen the carriers, than by having them shorter to be confined to the watering of such lands as are less proper for the purpose. It is probable also, that in particular cases the winter irrigation may extend through the whole of the level that has been set out.

Where it may happen that there are a great variety of different sorts of land below the line of level, such as low, flat, wet meadows, extended on the borders of the river, having pastures with dry, gravelly, or sandy tillage lands higher up, and moory or heathy grounds, so that the operator has it in his power to perform the business, at his option, on different sorts of land, it is too frequently the case to begin with the low grounds that admit of improvement in other ways, as by draining and proper manures of the fossil kind, and that are not only the most difficult and expensive in the execution, but often the least advantageous in the produce afterwards, except when the business is performed with uncommon correctness. Therefore, in examining such grounds as are situated below the mains or carriers, the irrigator should fix upon such lands as are, from the nature and condition of the soils and the smallness of their value, capable of affording the greatest and most speedy improvement and advantage. In most cases these will be found to be the more dry declining parts in the state of tillage, and the old worn out dry pastures. And in some instances the heathy and moory lands may be selected for this purpose with great chance of benefit.

Where it can be done, it is best to begin with such parts as are contiguous to, or approach the nearest, the mains or carriers; and, after having passed the water over them, to mark the lowest places, where it can be carried off to the best advantage; and from such parts it should then be seen to which other lands the water can be conducted with the greatest facility and benefit. Where the natural shelving of the ground is considerable, less care is necessary; but where this is not much, it may often be requisite to convey the water in a slanting direction for a considerable way, before lands sufficiently low for being covered by it are met with; as in



this sort of business it is invariably necessary, in order to prevent the waste of water, to proceed with that which is first made use of to its final outlet into the river before the works on other divisions are commenced.

On extensive sloping tracts of land managed in this way, it of course mostly becomes necessary to convey the water in a slanting direction across them. And an opportunity is thereby afforded of throwing it over the lands in the intermediate space, between the bed of the river and the *master drains or carriers*, and in this way one space or division of ground may be supplied after another, and the water conducted at pleasure to any given point, thereby enabling the operator to supply or omit any space or field that he may think proper, but still by this means preserving the regularity of the plan, which at any future period may be perfected.

In this view the most material circumstances to be attended to are the abundant supply of water and the quickness of its being conveyed off, as by its sluggishness or stagnation much mischief may ensue.

It is an advantage in this oblique or slanting method of watering, that it may be performed to advantage with a *smaller supply* of water than in others; as where that is the case it may be directed to such spaces only as it will be equal to, but when more abundant, it may be suffered to overflow the whole at the same moment.

And it is too frequently the case that the trenches and drains are so injudiciously made as to take off the water without the possibility of using it a second time; and there are other instances of its being conveyed into slopes without any care of its future course, thereby producing great inequalities in its consequent effects. These points should, therefore, be constantly attended to, and avoided as much as possible.

When the piece of ground to be floated is so much upon the level that the descent cannot easily be determined by the eye, it will be necessary to take an accurate level, and compare the highest part with the stream intended to be used, by which the degree of fall from the surface of the water to the highest point of the land will be ascertained: and in order to convey the water to this point, should it be distant from the stream, the sides of the ditch or canal should be sufficiently raised for the purpose not to keep the water in a dead level, but with such degree of descent as the two points will admit of. In the operation of cutting this canal or main feeder, it will be easy to preserve the proper degree of fall, having previously ascertained the length; for instance, in cutting fifty yards with a fall of five inches, it will be obvious that in every ten yards a descent of one inch should take place, this is necessary to keep the water in a constant lively motion. In some cases it may be necessary to have two main feeders, in order to effect a more equal distri-



bution of the water ; the depth and width of which feeders must be regulated by the supply requisite for the smaller gutters. Near to the mouth of the canal or feeder it will be proper to have a flood-hatch or *clow*, by which the water may be admitted or excluded at pleasure.

In forming the floating gutters, it is perhaps the best method to cut them at right angles to the feeders ; however, where the surface is uneven, in order to preserve a regular descent, a different direction must be given to them, the distance from each other being about ten yards, and the gutters becoming, as has been observed, gradually narrower as they recede from the main canal or feeder. The object in view being to throw the water as evenly over the surface as possible, these gutters should be so constructed that the water which has been introduced may overflow their little banks rather than run rapidly along the bed. Obstructions may sometimes occur, such as low parts, or deep ditches, over which a pipe or spout may easily be made to continue the progress of the water ; and such as proceed from ridges, roads, or small eminences, by trunks or other contrivances made to convey the water underneath them.

The necessary preparation for the introduction and spreading of the water being made, it will be proper to form drains to receive and carry off the water in nearly the same proportion that it has been introduced ; which is to be done by drains running parallel to the gutters at even distances from each, or, as the irregularity of the meadow requires, being made narrowest at the highest part, increasing in width as they approach the lowest (which is the reverse of the preceding works), until they arrive at the main channel that takes off the water that has been collected.

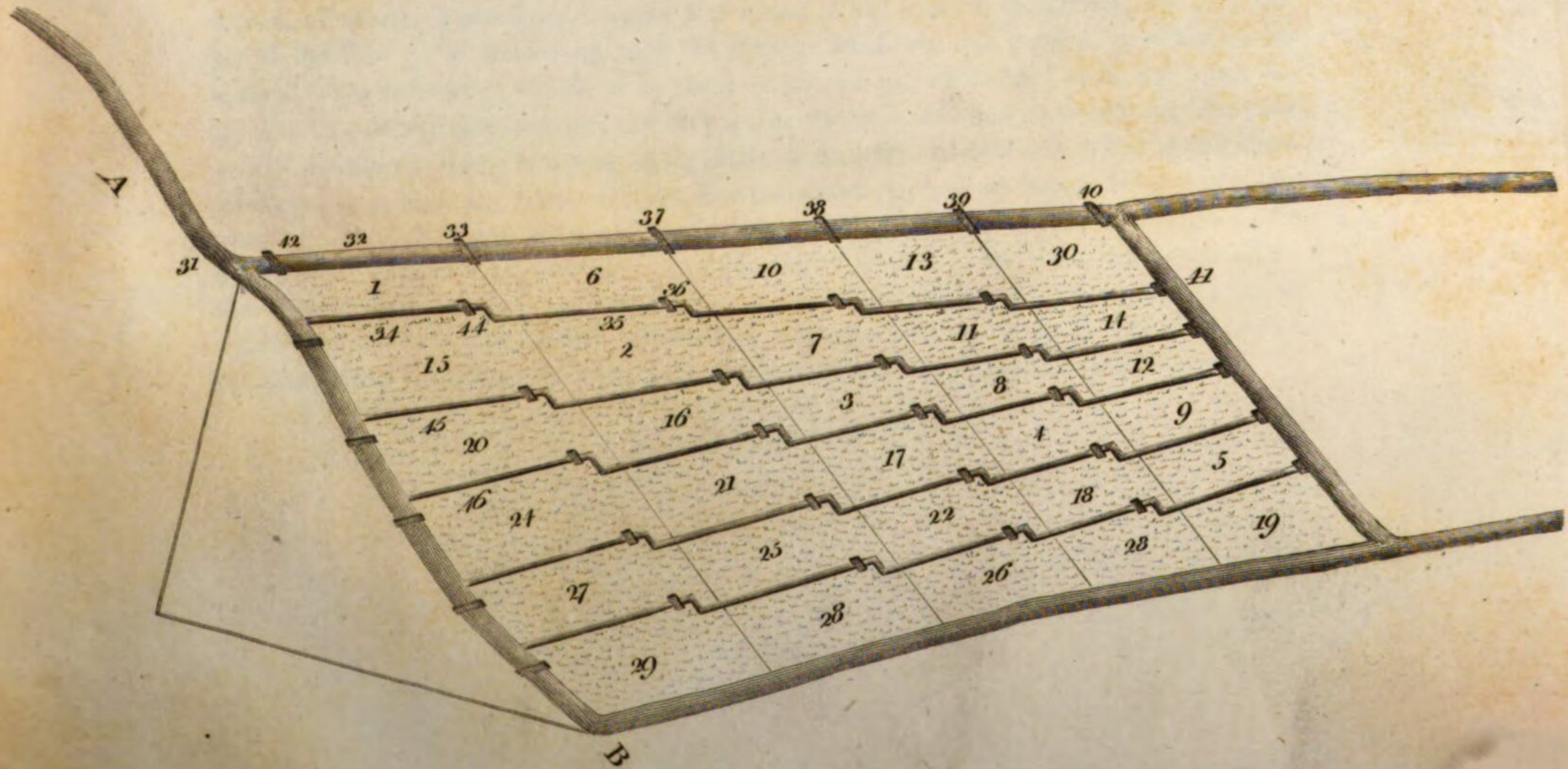
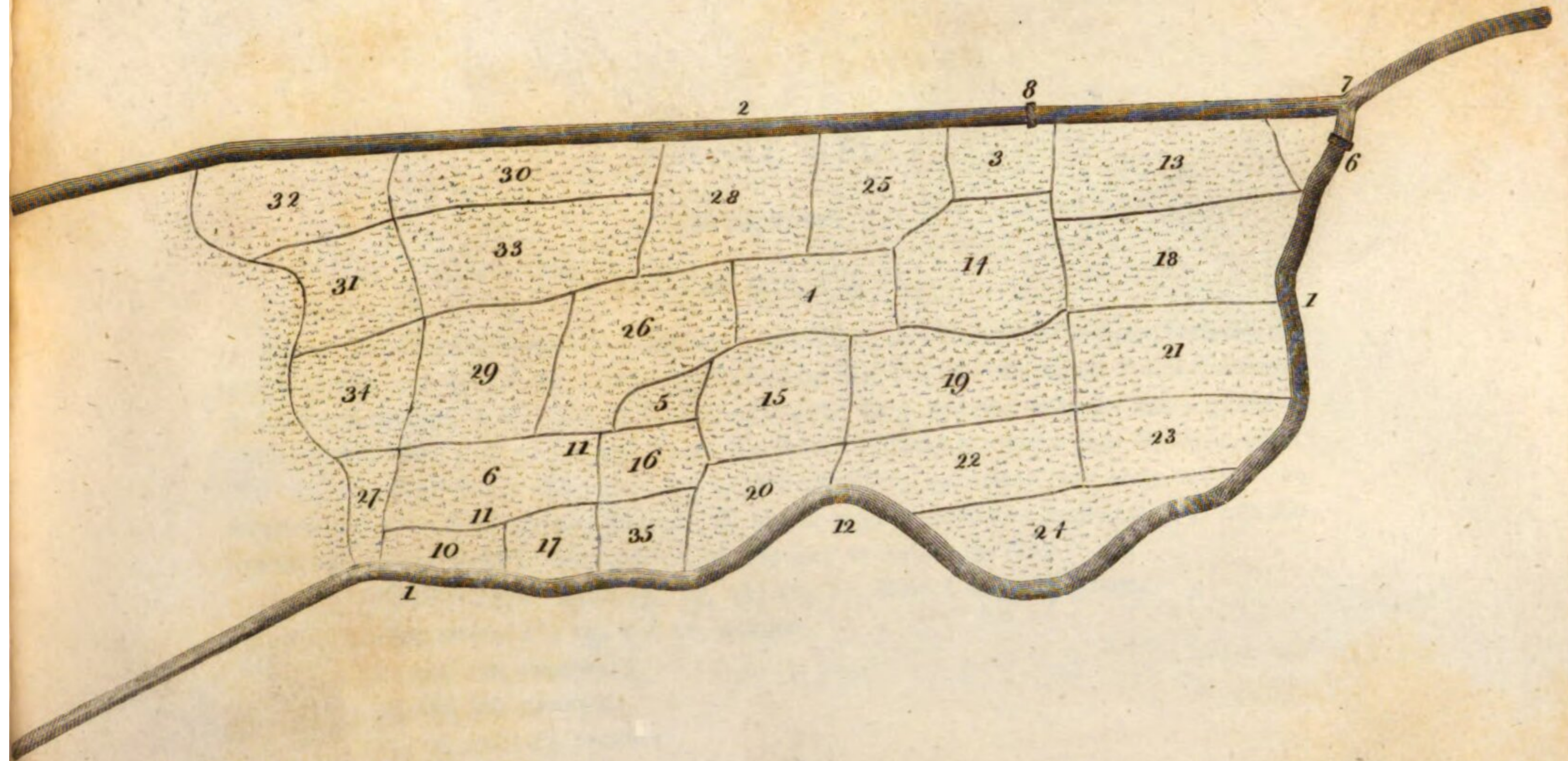
On the completion of these works, when the water is first introduced, it may, perhaps, be found that it will not spread itself evenly : this may be regulated by stops across the feeders or floating gutters, at such places or distances as the operator may find necessary : these stops may be made by putting down a stake at each side of the water and placing a board before them, thereby raising the water to such heights as may be required\*.

Some advise, that when the lands are quite level, or nearly so, ridges of about eleven yards wide should be formed by the plough, and raised about three feet on the crowns ; it will be of course necessary to use the spirit level in their formation, as well as in that of the top trenches for receiving the water from the *main carriers* ; and that

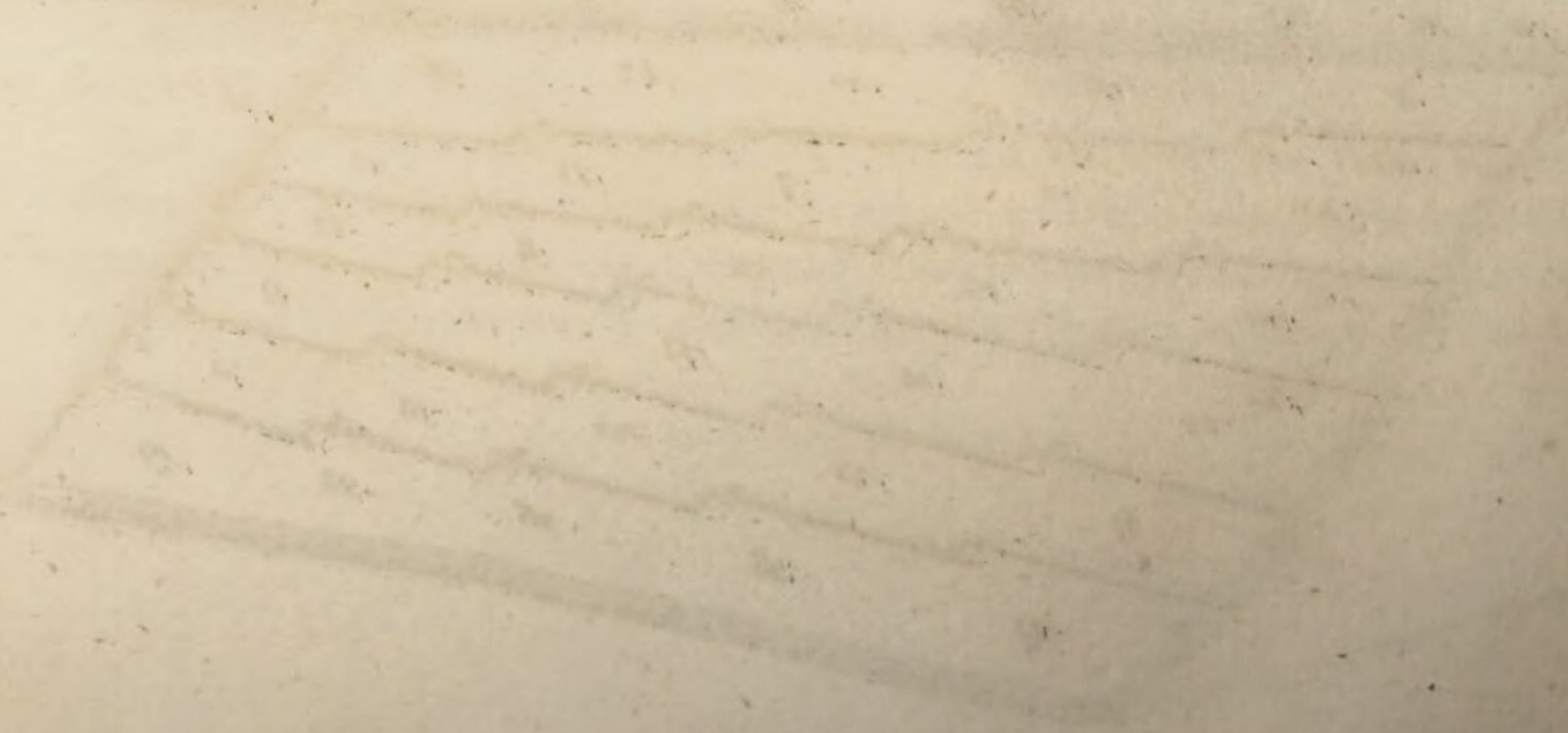
\* Boswell on Water Meadows.



# IRRIGATION.









## PLATE XXI.

### *Irrigation.*

[To face Page 928, Vol. II.]

*Fig. 1.* Explains the method of watering in an oblique direction over the space between the grand carrier and bed of the river, as described by Mr. Young. In which "1 is the river; 2 the grand carrier; 3 the field first watered; 4 the field watered after the first; 5 and 6 ditto, in succession; 7, 9, the *prise d'eau*; 8 a sluice to throw the water into the field where first used; 10 final exit of the water. But in this respect the variations may be as many as the forms which a tract of country presents. 6 may be a good meadow already: in that case the water may run to waste in the ditch 11, and so find its way to the river."

Thus, "the divisions 13, 14, 15, 16, 17, form a diagonal system.

The others, 18, 19, and 20, another.

21 and 22, another.

23 and 24, another.

25, 26, and 27, another.

28 and 29, 30 and 31, others.

32 and 33, by themselves, the one from the carrier, the other from the ditch between it and 28."

*Fig. 2.* Represents a watered meadow described by Mr. Young, where the slope from A to B is regular, but which is not material to the business. In this case, if "the water from the main carrier, river, or ditch, 31, be let into the delivering trench 32, and the stop 33 be let down, the water will flow over the pane or division of the meadow 1. The delivering trench 34 then acts as a drain, and conducts the water into the trench 35, the stop 36 being let down; thence, of course, it overflows the pane No. 2, and in like manner, successively, No. 3, 4, and 5. If the stop 33 be drawn up, and the stop 37 let down, the panes 6, 7, 8 and 9, are watered in the same way; and so on by the stops 38 and 39, which will water the panes 10, 11, and 12; also 13 and 14: and the stop 40 being let down, and 41 drawn up, the pane 30 will be watered. Then returning to the ditch at the other end of the field, and letting down the stops 42 and 43, the water will flow into the trench 34, and the stop 44 being down, the pane 15 is watered, and the trench 45 becomes a drain, which, successively, conducts the water, as above explained, over the panes 16, 17, 18, and 19. And when the trench 46 becomes supplied with water, and the trenches 34 and 45 are empty, the panes 1 and 15 are in a perfect state of drainage; which sufficiently explains the system, and shows how every trench operates, either for delivering or draining off the water, at the pleasure of the irrigator."







the drains on the sides may be properly constructed to convey it to the ditches. The trenches should be cut in a direction verging nearly to a point, in order to give an equal overflow of water the whole length : but where the land is sloping, trenches alone will be sufficient, causing an overflow in each direction.

It is further necessary, in attempting to improve meadows or other lands by the application of water, to ascertain that both the soil and subsoil are naturally dry, or have been made so by open or under drains, otherwise they cannot be benefited by watering, as has been found from much experience. Of course the previous operation of draining is indispensably necessary, before lands in which there is much moisture can be flooded with any probability of success. The perfection of watered meadows consisting in the operator's having it in his power to let on or take off the water at pleasure, it follows, of course, that a complete power of drainage is as requisite as the command of water.

The length of time which meadows should remain floated, and the necessary repetitions of the floating, must obviously depend on various circumstances: but as after every watering, the floater should be extremely careful to drain off the water from every part of the land, and as the most prejudicial consequences are known to result from any degree of neglect of this kind, it would be an useless expense to prepare a field for being floated, unless previously ascertained that it possesses sufficient declivity for carrying off the water when its continuance may be attended with injurious effects. In forming meadows of this kind, the drains that are to carry off the water, when no longer necessary, should therefore be as carefully attended to as those by which the water is to be brought on.

In short, it may be observed that this operation, as has been already shown, may be applied with utility to all those low-lying lands that are capable of being overflowed directly from the rivers or streams that adjoin them, or on which considerable proportions of water may be brought by a cut from a river at a higher level than the surface of the meadows, or the tops of the ridges ; if such preparation for watering has been made, the water being so conducted to the nearest part of the meadow, it is there branched out by a number of smaller cuts, made for the purpose. These cuts being filled with water, forced into them with as much rapidity as possible from the main cut, overflow their banks, and a general flooding ensues over the whole meadow if sufficient water be procured.

Where watered meadows are ridged up, drains are made in each furrow to receive the water which overflows the little cuts that are made on the tops of the ridges, and, falling into the drains in the furrows, runs off into the tail drain, and



which may be used to water some adjoining field, or reconducted to the river; so that, when the drains are properly formed, by stopping the inlet the field may be immediately laid dry. This is most expeditiously done where cross drains are made from those on the tops of ridges, so that the water is conducted into the drains in the furrows as soon as the main drain is shut. On meadows whose surfaces are irregular, and where an abundance of water cannot be procured, the cuts necessary to flood it can only be determined by the skill of the operator.

There is another description of watering, usually denominated *Catch-work*, which is applicable to such meadows, grass and pasture lands as are situated on the sides of hills, and capable of being watered by conducting the water of some stream round the edges of the hills. The method of watering such lands differs from the former, as fewer cuts are necessary, and these as nearly in parallel lines below each other as the bank will permit; the water by the main-cut having arrived at the top of the piece of ground, it begins to run over, overspreading all the surface in its course, and falling into the cut immediately below it, which, becoming full, discharges itself in the same manner into the next, and so on, till at last the water arrives at the bottom of the field, and falls into a drain made for the purpose of carrying it away, or conducting it to other grounds on lower levels.

In all cases where the watering system is undertaken, except in the time of floods, it may be highly useful to disturb the mud and dirt in the bottom of the *main carriers*, or drains, before watering, a practice frequently adopted on the continent. Lime has also been thrown into these cuts by some irrigating farmers, and raked with a heavy harrow or other implement at the bottom, which is a process that will be found to add considerably to the manuring quality of the water. It is probable that many other substances might be employed in the same way, and be thus spread over the surface of grass lands in a minute state of division, with vast advantage in promoting vegetation.

There is another method which seems capable of affording advantage in this business, especially when the lands are not well set with grass plants, which is that of sowing them with suitable grass seeds before the process of watering is commenced; but in these cases the water should not be continued flowing too long at a time, as by that means the vegetative power of the seeds might be destroyed. A good sward might probably soon be formed in this way.

To form meadows in a proper manner for watering is attended in many cases with considerable expense, but varies, according to circumstances and the nature of the irrigation, from six to twenty pounds the acre. Catch-work meadows from three to seven, besides the annual expense of implements and labour. In order to



# WATERING OF LAND.

PL. XXII

Pt. I

Vol. 2. p. 930

Fig. 2.

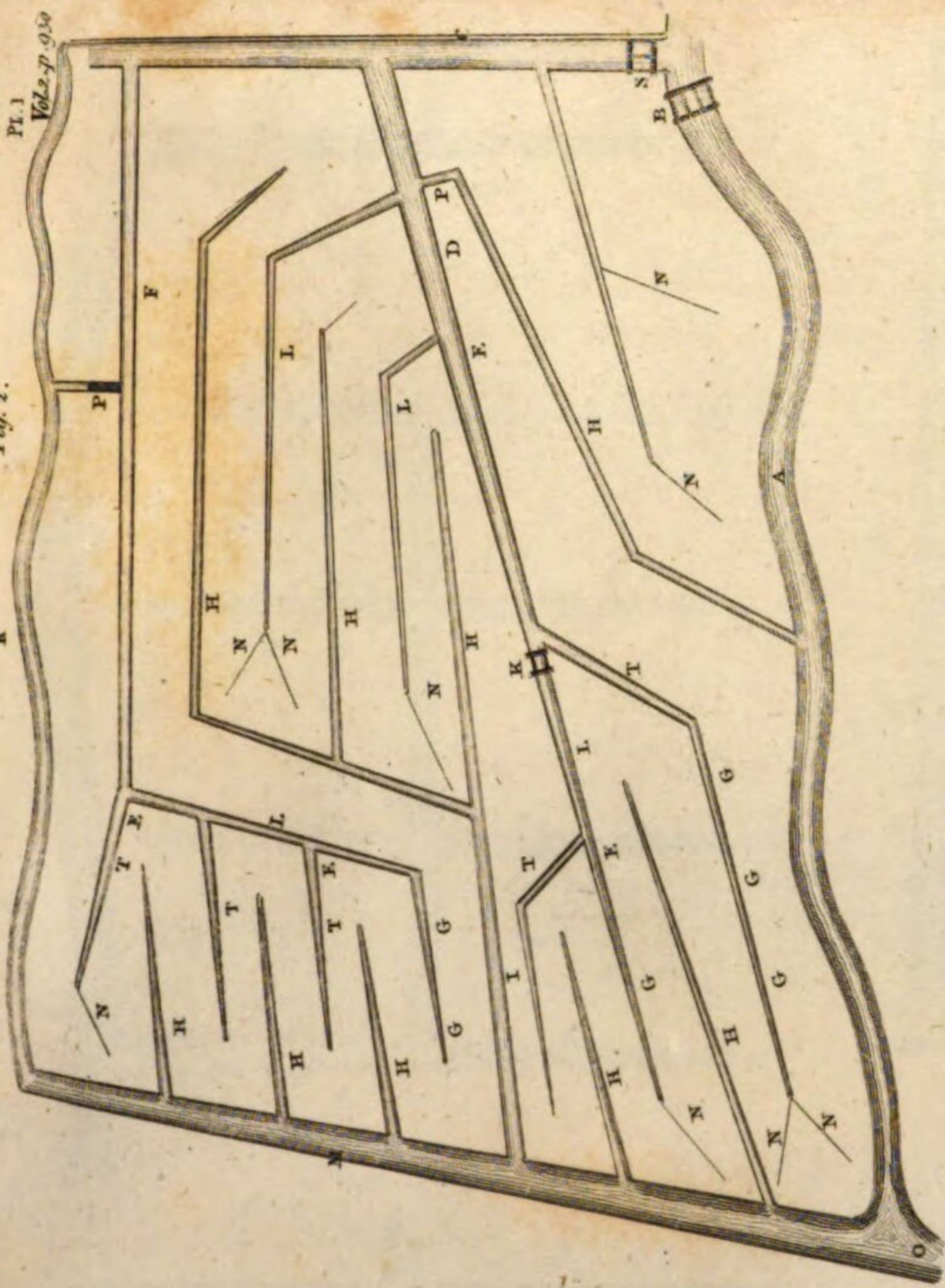


Fig. 1.

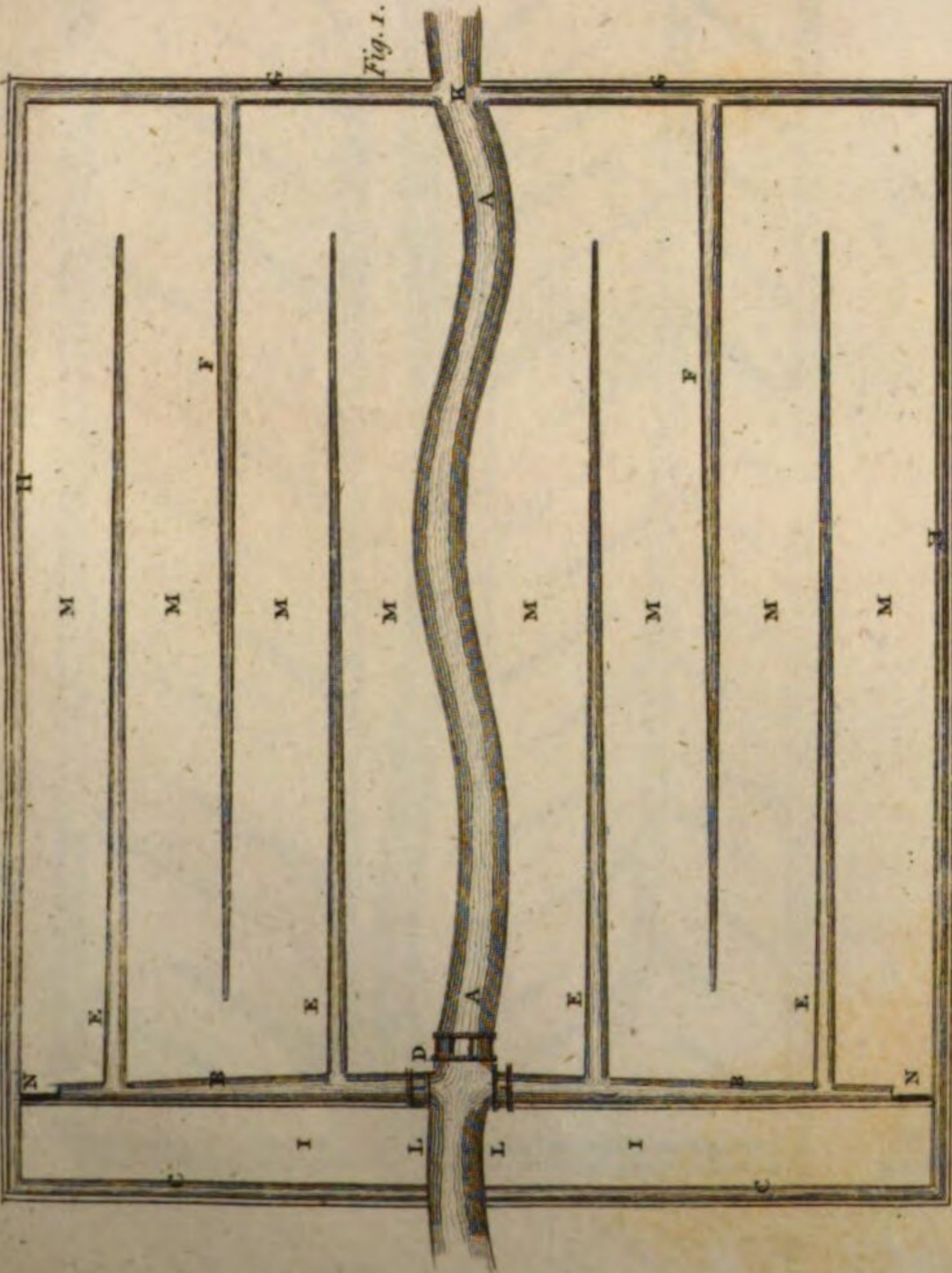
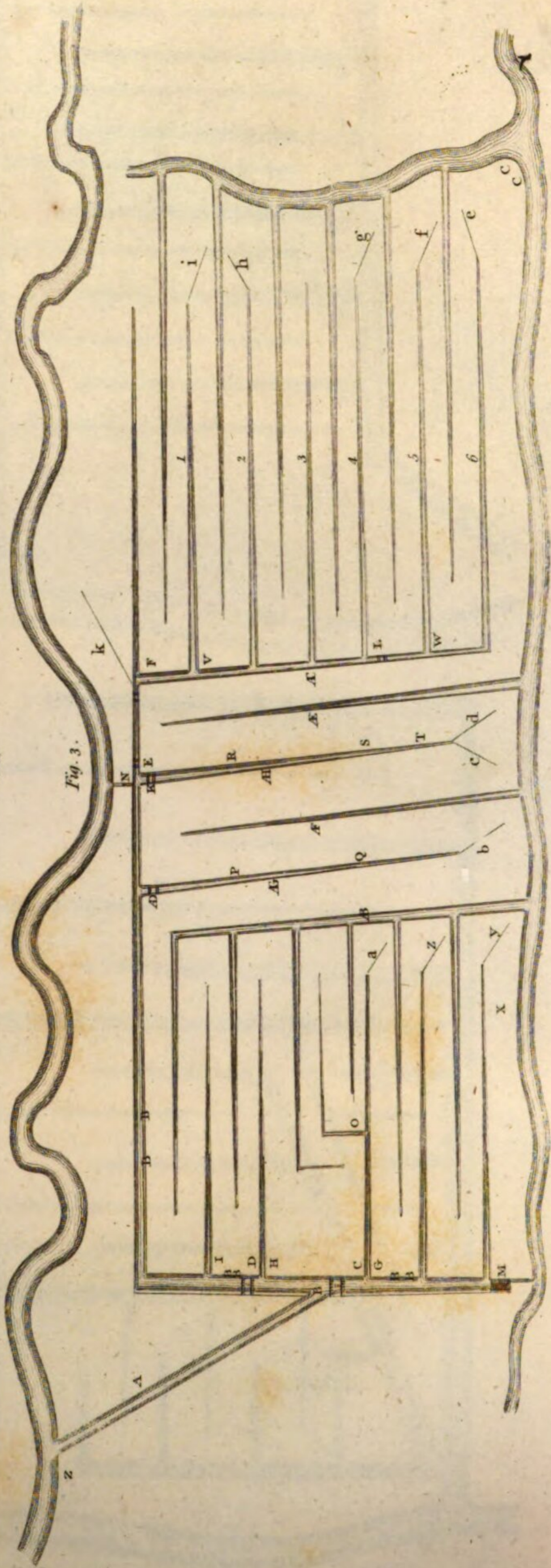


Fig. 3.









WATERING OF LAND.

PL. XXIII  
 Pl. II  
 Vol. 2. p. 930.

Fig. 3.

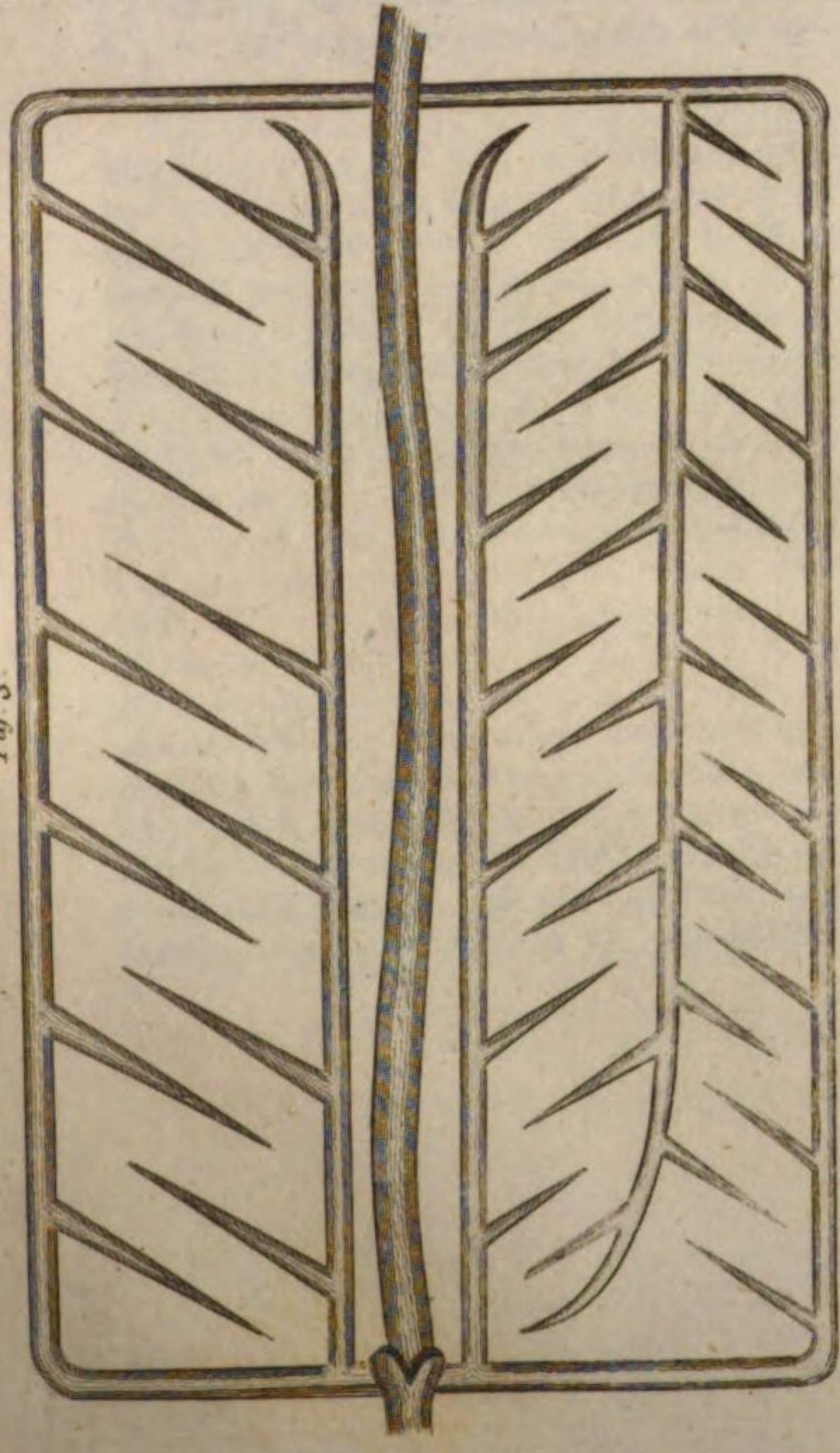


Fig. 4.

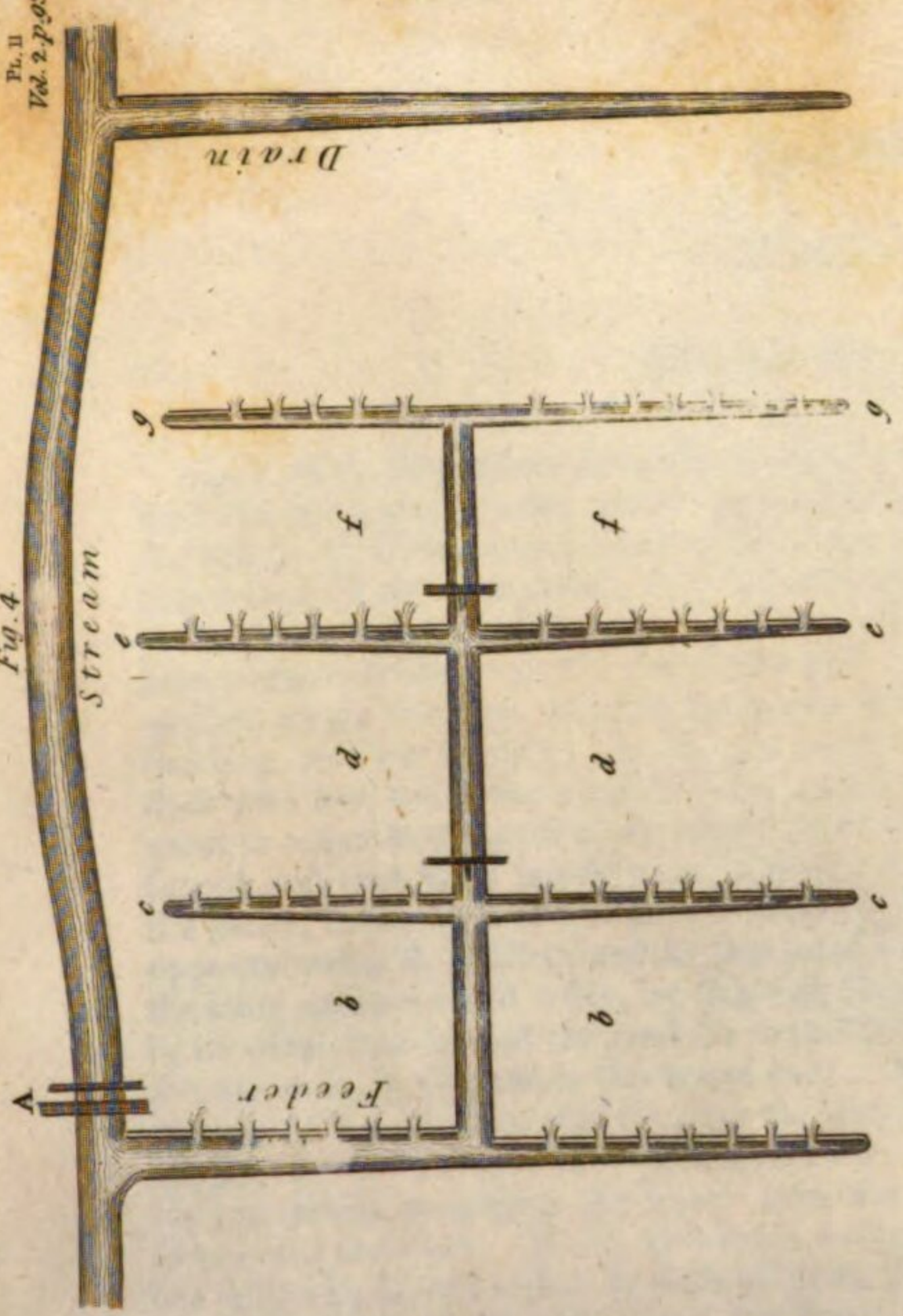


Fig. 2.

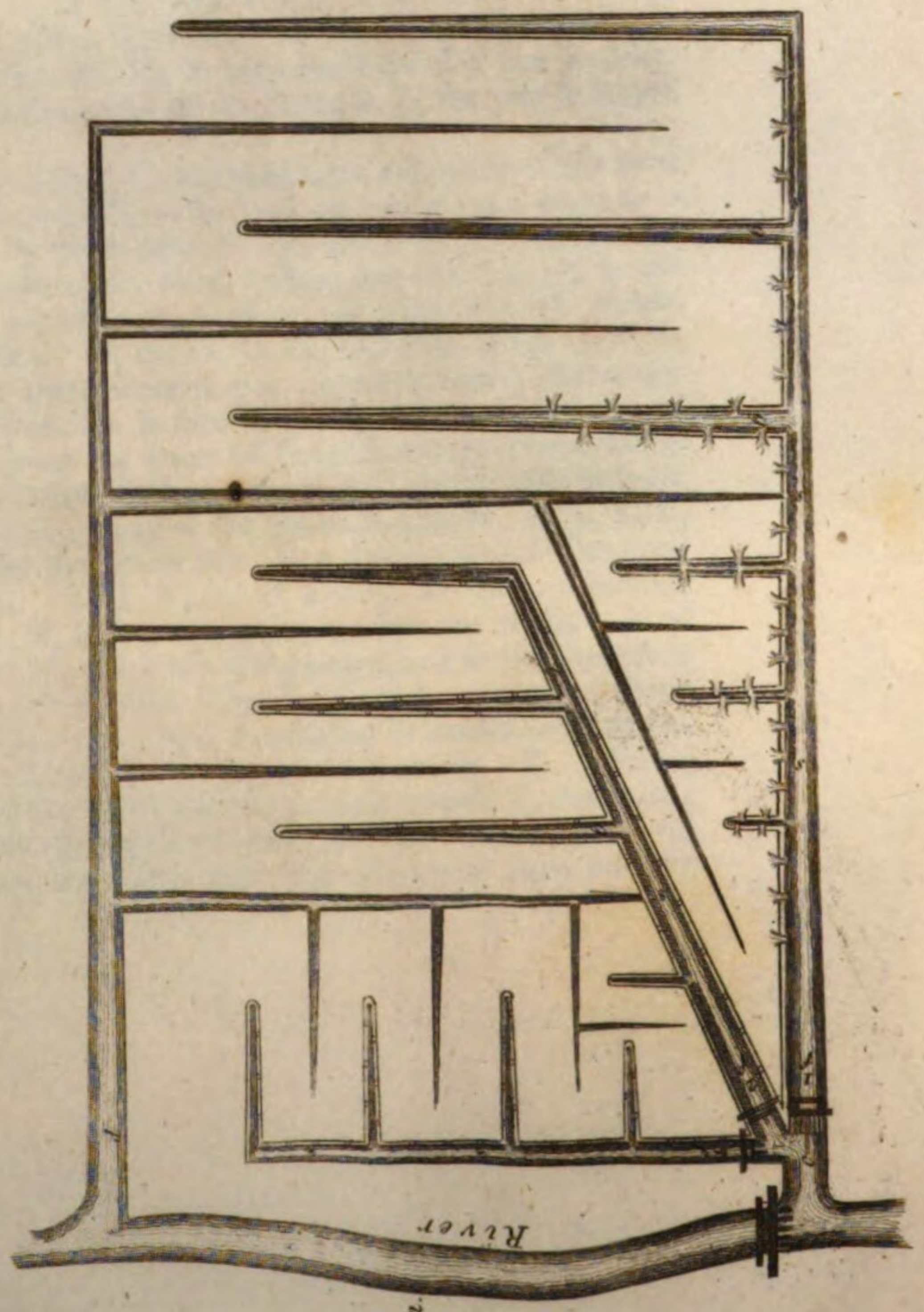
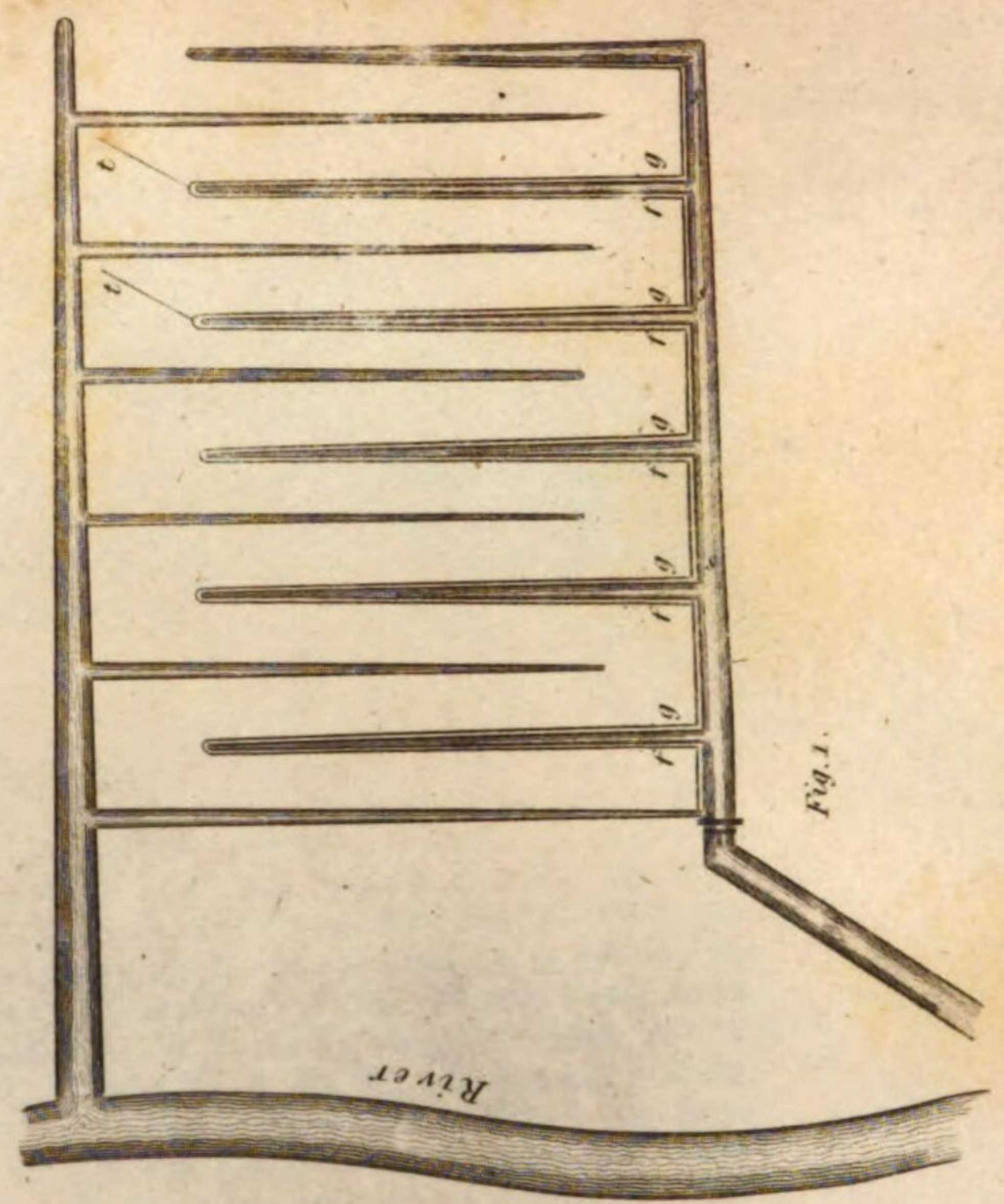
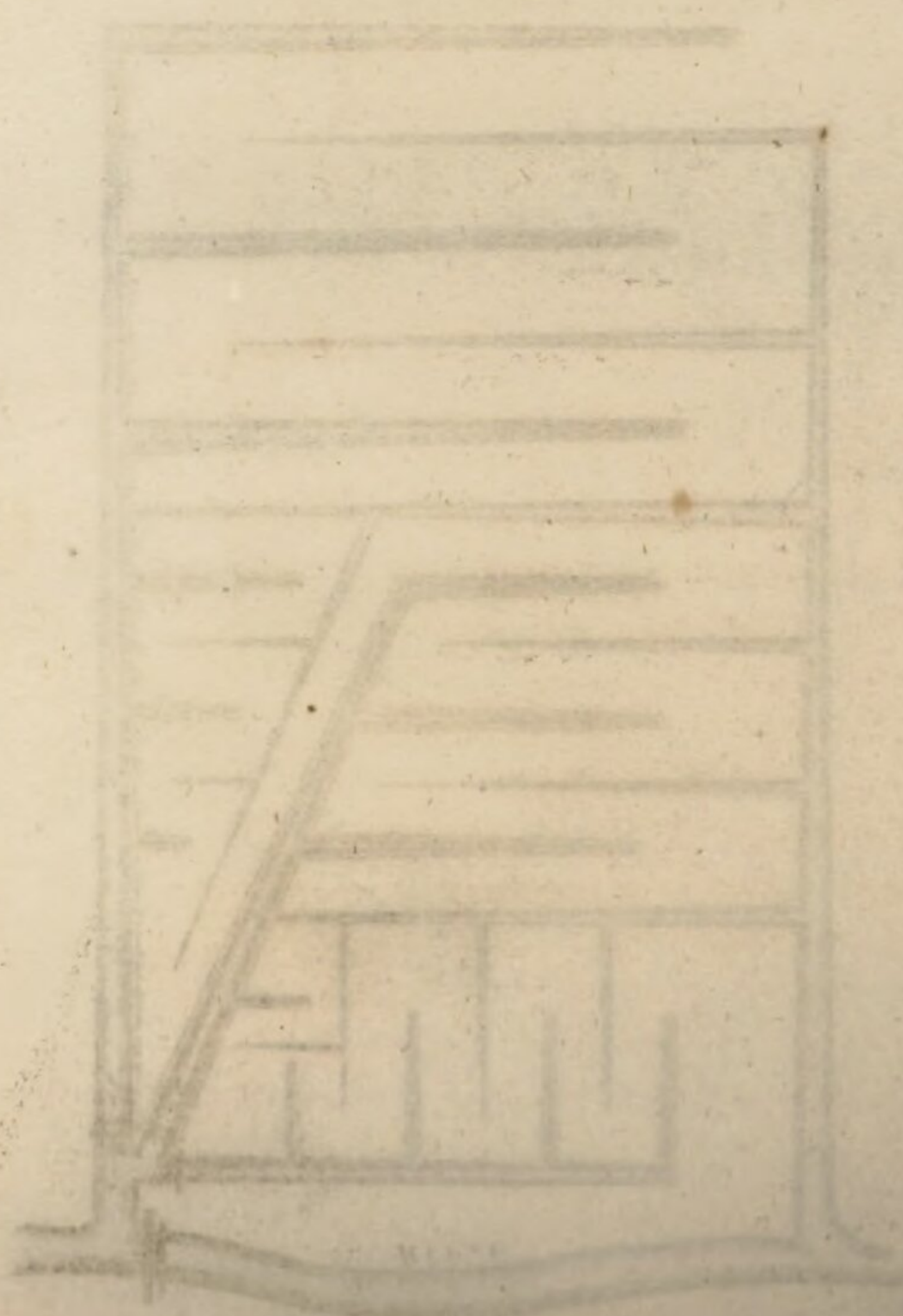
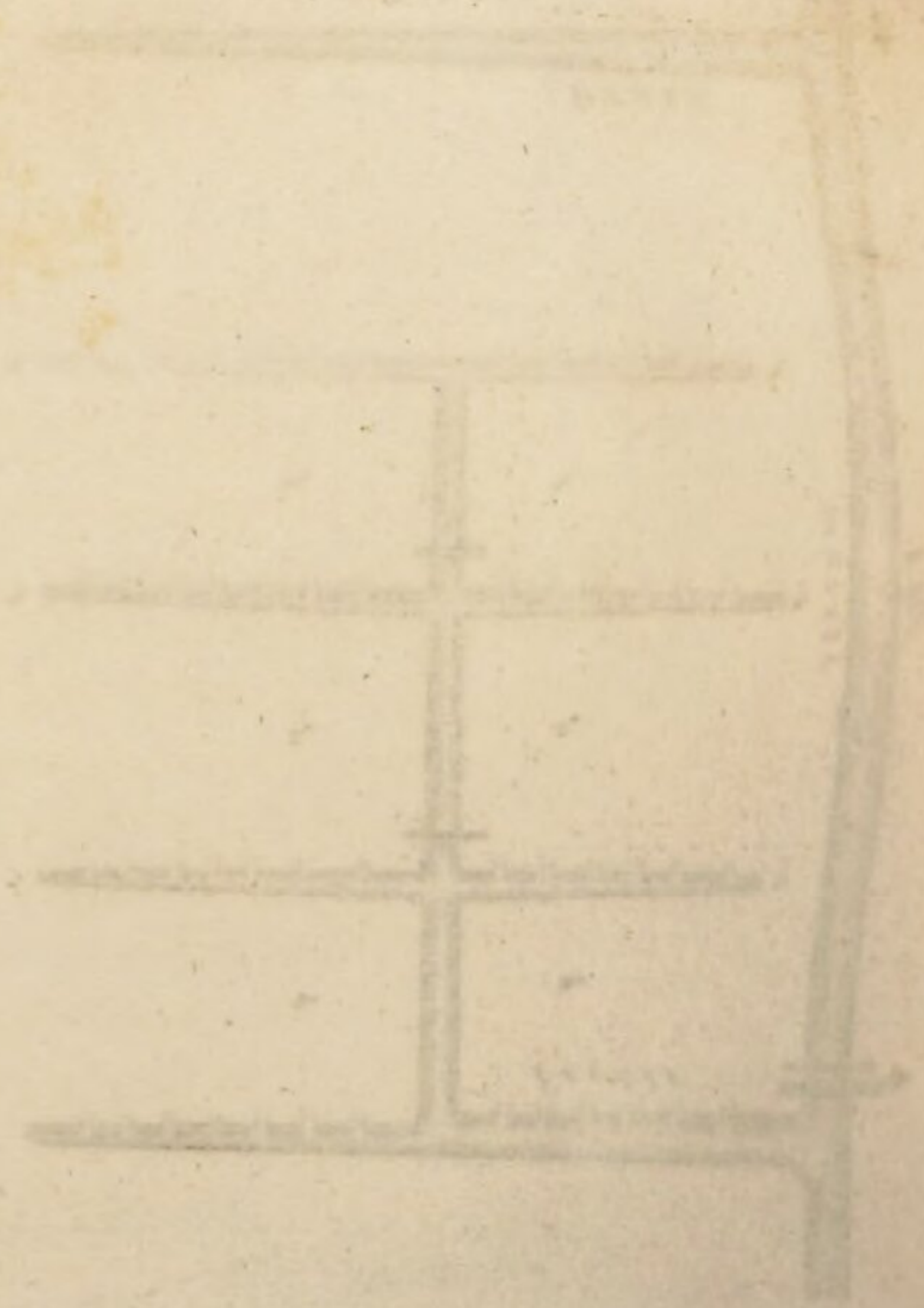
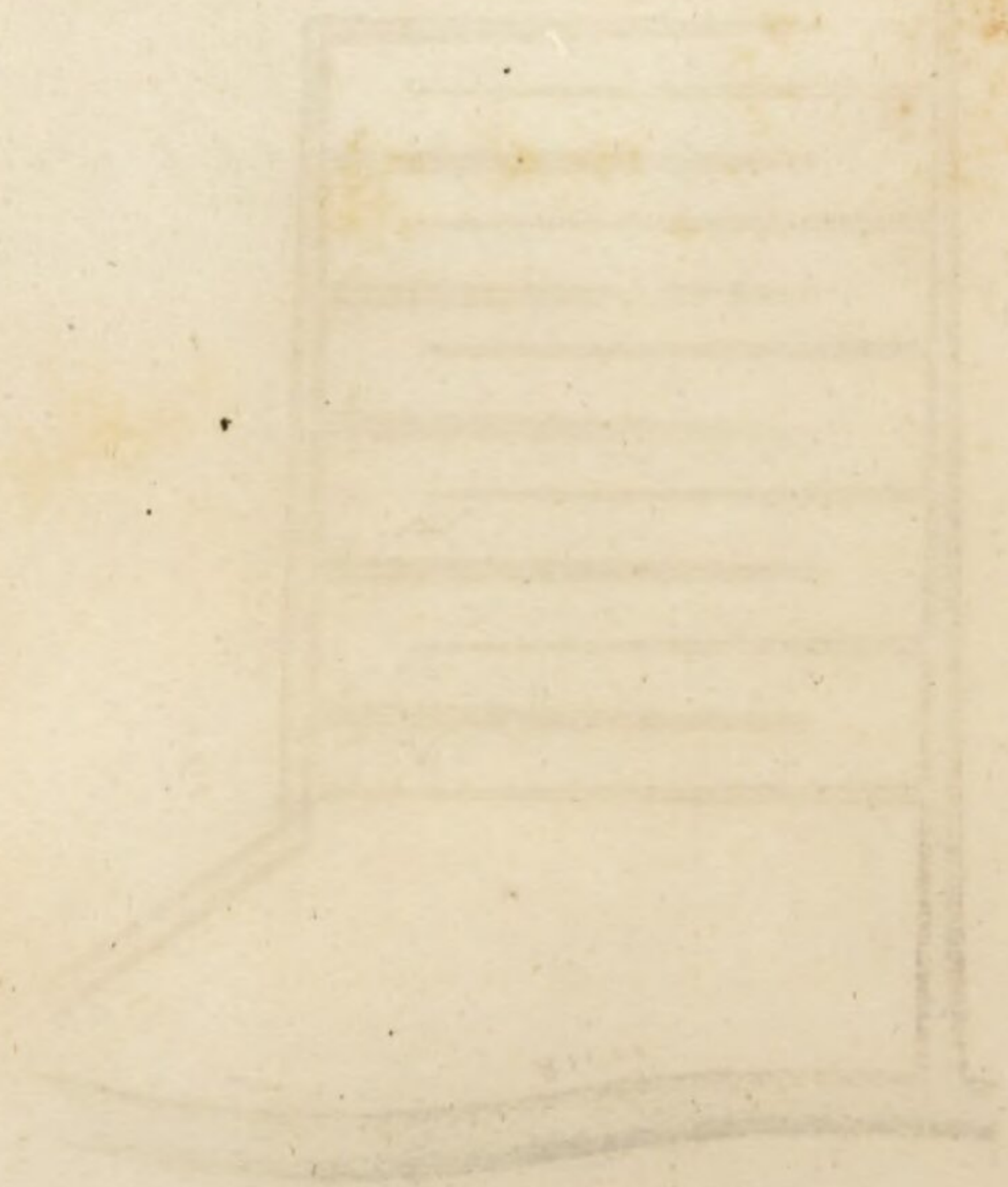


Fig. 1.









## PLATE XXII.

### *Watering of Land.*

[To face Page 930, Vol. II.]

*Fig. 1.* A, A, Represents the river running through lands. B, B, Two mains drawn at right angles with the river, one running north, the other south, across the meadow to within about six yards of the fences. C, C, fence ditches at the head of the meadow, used for tail-drains to convey the water that runs over the way-panes, I, I, watered from the upper side of the mains, B, B; by these fence-ditches the water is conveyed into the side-fence ditches, H, H, to the tail-drains, or lower fence-ditches, G, G, and discharged by them into the river A again at K. D, a wear erected across the river to force the water into either of the mains, B, B, which is done by shutting the wear D close. L, L, two wears erected at the mouth of each of the mains, B, B; their uses are, when the wear D is shut close, and there is not water enough, or it is not convenient to water both parts of the meadow at once, by shutting close one of these the current is forced into that main whose wear is open, thence to be conveyed through the trenches over the panes, to water that side of the meadow; then by shutting that, and opening the other, the opposite main, B, is filled, and by means of the trenches that side of the meadow is watered in the same manner; and lastly, by shutting them both, and opening the wear D, the water flows in its usual course, and the land on both sides is laid dry. E, E, E, E, trenches taken out of the mains B, B, to convey the water over. M, M, M, M, M, M, M, M, which are the panes or parts of the meadow that produce the grass. F, F, are trench-drains to draw off the water from the panes, and convey it into the tail-drains. G, G, the west fences of the meadow, here used for tail-drains to convey the water into the river. K, the place where they discharge themselves into the river. N, N, two drain sluices, one at the lower end of each main, used when the wears L, L, are either or both of them shut close; these drain sluices are opened to convey the leaking out of the mains into the fence-drains, H, H, to keep the land dry and healthy. I, I, are the way- (or road-) panes, watered from the banks of the mains B, B, the whole length of the mains.

*Fig. 2.* A, the river. B, a wear erected across the river. C, the head main taken out of the river above the wear B. S, a wear erected across the main C, to be kept close when the meadow is not watered. D, a smaller main, taken out of the head main C. F, another small main, taken out of the head main C. E, E, E, E, bends made in the small mains, and trenches just below the places where the branch-trenches are taken out of them, to check the water at those places, and force a proper quantity into branch-trenches. G, G, G, G, G, G, bends made in those branch-trenches which have so much descent that, were it not for these bends, the water would run down almost to the end of the trenches before it would flow over the panes. H, H, H, H, H, H, H, H, H, trench-drains to convey the water off from the panes. There should be one on each side of every trench, unless a fence-ditch, or the river, can be used instead. P, P, sluice-drains, to convey the leaking of the water out of the mains D and F. L, L, L, L, trenches taken out of the small mains, to convey the water into the various parts of the meadow, which at the lower part increases in width. T, T, T, T, T, T, branch-trenches, taken out of the other trenches. N, N, N, N, N, N, N, N, N, various gutters taken out of the ends of some of the trenches, to carry the water to the longest corner of the panes, and sometimes taken out of different parts of the trenches, to water some little irregularities in the panes, which without such assistance would not have any water upon them. I, a master or considerable drain, into which several others empty themselves, and thence run into the tail-drain. K, a sluice, erected at the end of the small main D, to force the water into the branch-trench T, that being the highest ground. M, the tail-drain, which receives all the water from the other drains, and conveys it into the river at O, the point where the water from the tail-drain runs into the



river. R, a fence ditch, being the bounds of the meadow on that side, and used also as a drain to convey the water into the tail-drain.

*Fig. 3.* A, the head main, taken out of the river, forming an angle of about 60 degrees. The descent of the land permits the main to overflow it at B, the point where the meadow can be watered; consequently the place for the main B B to be drawn, at right angles with the stream, the whole breadth of the meadow intended to be watered, excepting about five yards at each end. C, D, two weirs erected to turn the water either way; or, when both are shut, to keep it in its proper current. E, another wear for the purpose of dividing the meadow into turns. F, G, H, I, K, L, AD, sluices to convey the water into, or stop it out of the trenches, as found necessary. M, N, two drain sluices. O, P, Q, R, S, T, V, W, bends to stop the water in those trenches which have the quickest descent. X, Y, Z, a, b, c, d, e, f, g, h, i, k, gutters to carry the water to the ends of the panes, and little irregular parts in the meadow. C C the lowest part of the meadow, where water is conveyed away. From the main B B to the principal drain A B, the meadow is watered regularly; but betwixt that drain A B and the small main A C, there is a great flat. To fill it up would be the regular method, so that the trenches taken out of the main B B should go down to the end of the meadow; to avoid that expense, the main B B is continued down on the east side of the meadow, till it has passed the flat grounds to F. Materials being had from the drains, &c. to raise the ground high enough to convey the water in the main on to F; which being the high ground, it is then carried east and west, the same as the main B B. Trenches are taken out of it, to water the lower part of the meadow. Trenches are also drawn out of the main that runs north and south, to water the flat part the opposite way; with drains between them to carry off the water into the west fence ditch: at E a wear is built to stop the water, and turn it into the trenches above it; at F a sluice is placed to turn the water into the main A C. For the same reason, the sluices A D and K are set at the mouths of these trenches to force the water down to the lower divisions of the meadow. The trench-drains A E and A F convey the water from the upper pane of the main A C, and also from one of the cross trenches A H. And A F and A B do the same from the other cross trench A G. To water this meadow it will be necessary to divide it into two, or perhaps three turns, if water should be scarce. One turn will be made by opening the wear C, and shutting that at D; the sluices G and H being also opened, the water will flow over the lower side of the main B B from D to M, down all those trenches that are taken out of it; and will be carried off from the trench-drains by the principal drain A B to C C. Thus will that part of the meadow be watered. Another turn is made by shutting the wear C, opening D, and shutting E. The sluice H being stopped, and the sluices I, A D and K opened, that division of meadow from the wear D to E will be watered, and the panes on each side of the main B B also, by the water flowing over its banks as it passes along; which is carried off on the one side by the river, on the other by the principal drain A B; and also from the panes on each side of the trenches A G and A H, by the same drains A B, and the trench-drains A F and A E, into the west fence drain to C C. The other turn is made by shutting the sluices I, A D and K, opening the wear E, and so much of the sluices F and L, as will let water enough through to supply the trenches below them; keeping that at F partly in, to turn the water into A C; and that at L the same also, partly to check the water, and force it over the sides of the small main A C, and into the trenches 1, 2, 3, 4. The reason for putting the sluice across the small main A C at L is, that part is supposed to be flat ground from L quite to C C; consequently, the water would, if not prevented, run so fast down to the ends of the trenches 5, 6, as to draw all off from the high grounds, from L upwards. The small main A C is too wide to be checked by a bend at that place; besides, it would not answer so well to regulate the quantity of water necessary to water the panes from L to C C; and it is on the account of those trenches 5, 6, that a sluice is built. The water which runs out of this meadow at C C is, if the descent is quick, immediately made use of to water the next meadow below; or if there should be but little descent, it is oftentimes considered as a head main; and wherever below it will rise over the land, it is again made use of, in the same manner as it was at first in this plan of watering.



overbalance so great an expenditure, great and permanent advantages should be the consequence. However, in some instances this does not prove to be the case, especially when the soil and the water are not both well adapted to the purpose. But, as such cases seldom occur, it may be generally said, that it is an important means of improvement, whether the object be hay or pasturage.

The great degree of verdure and luxuriance which almost immediately succeeds the occasional covering of grass lands with water, sufficiently demonstrate the power which it possesses in promoting vegetation. It is a means of fertility that has been employed for ages in more warm climates, with the most beneficial consequences in increasing the quantity of vegetable produce. But though it has been long in use in other countries, and of late more particularly attended to in this, the principle on which it produces its effects does not seem to be fully understood. In speaking of manure as the food of plants, we have already noticed some of the properties of this fluid that may be useful in the vegetable economy when taken up by the fibrous roots of plants; and there are still other ways in which it would seem to be advantageous in forwarding the growth of grass crops.

In climates where the heat is considerable it may be of much utility, not only by keeping the fine fibrous roots of the grass or other plants in a moist patulous state, the most proper for the purposes of absorption, but in such a temperature or state of heat, from the cooling effect produced by the constant evaporation that is taking place near the surface of the ground, as is the most suitable for their healthy and vigorous growth. It is probably in this way that garden plants are principally benefited by the application of water in the hot summer seasons in our own climate; as when the waterings are not constantly kept up, injury rather than good is mostly experienced.

But another and more beneficial way in which grass produce may be immediately increased, and the fertility of the lands more permanently improved in this country by the floating or covering them with water, is from the waters of the rivers or brooks that are turned upon them containing, either in the state of solution or diffusion, a variety of different sorts of enriching materials which they gradually and evenly deposit upon the surface while they rest upon or slowly flow over it. This must be the case in all those instances where the rivers or streamlets either arise in, or in their course flow through or over, beds of chalk, marl, or other calcareous strata; as in their passage they become highly impregnated with the fine particles of these different substances. And where they are fed by the small runlets which receive the waters that proceed from the higher and more elevated



lands, they must often, especially after heavy rain, be loaded with a large proportion of fine rich materials of the animal, vegetable, or other kinds, which they deposit in a regular manner in their tardy trickling course over the surfaces of the fields.

But it would appear that waters thus impregnated produce the most beneficial effects, particularly when not in flood, upon the lands that are the nearest to the sources whence they become principally impregnated with their fertilizing principles; as when they have flowed to some distance they have, in a great measure, deposited and let fall such enriching substances, and are become too pure for affording advantage in the way of deposition. It is only in the time of floods that they can produce much utility in this way at any great distance. It was found by an able philosophical writer, that the water of the Darwent, though it flows for several miles, near Matlock, through calcareous strata, contained no impregnation of this sort on its reaching Derby, although the springs in that neighbourhood had a large proportion of it in their composition\*.

The same author has ingeniously suggested another mode in which water may prove serviceable in floating grounds in this climate, which is that of protecting the grass or other plants from the too severe effects of cold during the winter or early spring season. In this view it is observed, that the water of strong springs, which in this country have constantly the temperature of forty-eight degrees of Fahrenheit's thermometer, is to be preferred to that of rivers, where it can be procured in a sufficient proportion, as the degree of cold in these is in the same ratio with that of the atmosphere till it declines to the freezing point, or that of thirty-two. Though both when spread out, forming a thin sheet of ice on the surface of the land, are beneficial in defending the roots of the grass plants from too intense degrees of cold, and of thus preserving them in a more healthy condition; and it is added, that those of some sorts of grasses are supposed to even vegetate beneath the ice, as the rein-deer moss in Siberia vegetates beneath the snow, in a degree of heat of about forty, which is the medium between that of the inferior surface of the dissolving snow, or that of thirty-two, and that of the common heat of the internal parts of the earth, which is forty-eight; and in this manner the grass produce in this cold country be considerably increased, so as, under proper management, to nearly double the usual annual quantity under other circumstances†.

In illustration of these principles it may be observed, that the water issuing

\* Darwin's Phytologia.

† Ibid.



from springs where they abound with the particles of gravel, or a flaty mouldering kind of rock containing a large proportion of calcareous earth, are known from experience to be better adapted to the purpose than that which arises from others that do not contain such materials. The difference in the effects, often so visibly produced, has been accounted for, from watering one field from a spring issuing out of a chalky soil over those which take their rise in another, similar in every respect and management, except that the water applied arises in, or flows through, a swamp or morass, composed chiefly of peat earth, or proceeds from situations known to contain none of these substances.

The fact is unquestionably established, that the water of rivers which run through comparatively level and fertile countries is not only better than that of such as have their courses through mountainous, unproductive tracts, but superior to all others, as every different streamlet adds a new accession of fertilizing materials, which, being dispersed over the surface of the meadows in their fine and attenuated state, cannot avoid adding a considerable degree of improvement to the lands.

Winter and spring are the two seasons when meadows are usually watered, as from the month of November till the beginning of March: the experience of the operator can alone regulate this proceeding as to the length of time they should remain under water. In some districts the water is allowed to flow over the fields for several weeks together, with only the interval of a day or two occasionally; in others, the practice is to flood them the alternate weeks. When frosts set in, floating is usually suspended; but it has been remarked that in such cases the succeeding crop of grass has been abundant. As the spring advances, much less floating is found to be necessary. However, in all cases, when floating is performed to advantage, the meadows should be laid dry between every watering.

On the sandy, gravelly, and drier kinds of land, the water is directed not to remain so long at a time upon the land as in those of the heavier kinds. In the latter sorts Mr. Wright thinks three weeks long enough, but Mr. Boswell advises a month, or even six weeks, in the first waterings, about November; but a something shorter time for those of the former sort. In December and February Mr. Wright recommends the land to be let dry for the purpose of air for a few days, and in February particular attention is advised not to permit the water to flow over the ground many days together without being taken off, as there may be danger from white-scum being formed; and if the land be left exposed to frost in its wet state it may be injured in that way. These different inconveniences, it is said, may be avoided by



taking the water off in the day time, and turning it upon the lands during the night\*. Mr. Boswell does not, however, seem to apprehend any danger in this way.

About March there will mostly be a sufficient bite of grass to admit the lands being fed by stock : the water should, therefore, be turned off for a fortnight, to give it sufficient firmness before they are turned in. During the following month the grass may be eaten close, but not later; as continuing it even for a few days in May would greatly injure the hay produce which is to be obtained both in quantity and quality. In the month of May, after the grass has been fed down, the water should be again turned over the lands for a few days †, by which the land is so moistened as to produce a full crop of hay. It is probable that with less close feeding two crops of hay might frequently be taken with advantage. The first crop of hay from watered meadows, when cut sufficiently early, is equally good with most other sorts, but when let stand too long becomes coarse and unfit for fodder ‡.

It has been observed on this subject by a philosophical observer, that where the flooding of lands is continued some time, the water should only be suffered to trickle or flow over it gently from the higher parts, and not stagnate upon it; as in the latter case the grass roots are soon destroyed in the spring, and, that when such materials begin to decay underneath the water, a white scum arises in consequence of the air set at liberty by the beginning putrefaction, which has been suspected as prejudicial to the grass, but is rather the effect than the cause of the mischief, and demonstrates that the water has remained too long in a stagnant state upon the ground, and requires to be removed or to have a fresh supply from the stream; but the former is probably the better §. The necessity of continuing the watering after it has been begun, in hot climates and seasons, has been already mentioned; and there may be injury done to the grass plants by the sudden application of much water under such circumstances of great heat ||.

The beneficial effects of watering meadows is obvious in producing an early and luxuriant vegetation, with proper soil and water, as appears by a comparison made by those who had an opportunity of seeing Mr. Bakewell's judicious application of this means of improvement on a piece of ground set apart for experiments in this branch of husbandry. If they had pursued their survey a little further, they might

\* Wright on Floating Meadows.

† Ibid.

‡ Ibid.

§ Darwin's Phytologia.

|| Ibid.



have discovered, that while the Dishley fields were covered with an almost perpetual verdure of the most nourishing grasses, those of the neighbouring farmer were famous only for the rushes and other weeds which they produced.

As the grass of watered meadows is very forward in March and April, they are generally pastured in the spring with sheep; and to those farmers who keep them for breeding or fattening, it becomes almost invaluable from the scarcity of green food at such times: after being flooded again in the latter end of April, they are shut during the summer for the hay crop. The after-grass is eaten off in autumn with cattle, it being considered as very pernicious for sheep to pasture on watered meadows. The *Suffex Report* records a remarkable instance of its fatal effects: "Eighty ewes, from Weyhill fair, were turned into some fields adjoining a watered meadow: a score of them broke into the meadow for a night, and were taken out in the morning and kept till lambing; they produced twenty-two lambs, all which lived, but every one of the ewes died rotten before May-day. The remaining sixty made themselves fat, nor could a rotten sheep be discovered amongst them."

That the grass of watered meadows should be so nourishing to sheep in the spring, and should prove so destructive to them in the autumn, is not easily accounted for; but the fact appears to be established beyond doubt. Mr. Boswell advises, that no sheep, except those that are just fat, should ever be suffered, even for an hour, in watered meadows, as they will infallibly rot them at any other season than the spring, especially if made from low, boggy, or swampy ground: "not so when made from dry healthy land."

On farms where it is convenient to have three or four meadows that can be watered, it will be found very advantageous; as while cattle are eating the first, the second will be growing, the third draining, and the fourth under water\*.

In Wiltshire watered meadows are of considerable advantage to the farmers, as they afford an early supply of grass for the forward or early breed of lambs, on which they begin to feed them about the middle of March, having previously withdrawn the water from the meadows and laid them as dry as possible. On a good crop of grass of this kind five hundred couples may be fed for one day on an acre. The practice is to hurdle out, daily, such a portion of the ground as is necessary, leaving a few open spaces in the hurdles through which the lambs may feed forward on the fresh grass. The hours they are suffered to feed on this grass are from about

\* Boswell on Water Meadows.



ten o'clock in the morning till five in the afternoon, when they are generally folded on the contiguous barley fallows.

This practice is supposed to have its advantages from its manuring a part of the farm without having recourse to the dunghill, as well as in affording a very early supply of food for the sheep at a season when green food is scarce, and in being ultimately useful to the other stock, affording much manure, and thereby enriching other lands. It is supposed to be an improvement that every farmer ought to adopt and encourage, where soil, water, and situation are favourable.

A remarkable instance of the beneficial and fertilizing effects of watering was observed in the beginning of the autumn of 1796, when grass that had not had the advantages of water was nearly burnt up. A close of about twenty acres, which had been irrigated, had a most luxuriant after-grass of from six inches to a foot deep. And a neighbouring inclosure of near forty acres afforded support for three months to forty-seven horses and bullocks, all which thrived very well \*.

Another proof is mentioned of the great utility of these meadows, in affording a most seasonable supply of grass to farmers at a time when they are most distressed for food for their stock. Forty acres employed in this way was found equal to the support of 500 Wiltshire ewes and lambs from the middle of March to the 1st of May, or about six weeks, and the improvement of the stock in that time one shilling a week, or three pounds fifteen shillings per acre. In some parts of Middlesex, five pounds' worth of hay might also be taken off the first week in May †.

On the whole, there can be little doubt of the great advantage of this method of improving grass lands in situations where it can be conveniently made use of, and that it is capable of being applied in a much more extensive manner than has been hitherto the case, by the operators properly availing themselves of the occasional falls of rivers and small streams, as well as of canals, in some seasons ‡, is not to be disputed, as by such means water may often be distributed over vast tracts of land that have never yet been thought capable of admitting of such a mode of fertilization; and, in

\* Middleton's Report of Middlesex.

† Ibid.

‡ Mr. Templer, of Stover in Devonshire, according to the Agricultural Survey of that district, experienced very considerable beneficial effects on a tract of marshy land on the borders of his canal—It had produced from five to ten shillings an acre. After having it drained and levelled, by forming conductors for the over-plus water of the canal during the winter floods, and distributing it by well-arranged sluices, throwing the enriching particles upon the surface, he converted these marshes into valuable verdant meadows.



others by having recourse to damming them up; and the occasional use of wooden pipes in the conveying it, when necessary, may be easily raised to heights sufficient for conducting it over many more elevated lands, and thus promote their vegetation and produce in an incalculable degree.

On heathy moors and mountainous tracts this system might often be applied with a prospect of most ample advantage. Innumerable instances are daily occurring to the attentive observer, in traversing these hills, of little rivulets or rills, insufficient to form a regular course, spreading their waters, and providing a most beautiful

The method of constructing these distributing sluices is, by a number of trunks placed at various distances, to each of which a plug is fitted; and when the floods swell the canal above the level requisite for navigation, these plugs are taken out, and the water immediately overflows the surface of the meadows, being at any time easily restrained by replacing the plugs: similar success attended a like process on lands in the upper line of the canal.

And, in the Agricultural Report of the North Riding of Yorkshire, it is observed, "that on the northern margin of Ryedale and the Marishes, a range of limestone heights extend in an eastern and western direction for many miles, but which, in width, is no where more than about four miles. This tract is entirely destitute of water, except what flows along the bottoms of the deep valleys by which it is intersected, and which are several miles asunder; little relief can consequently be afforded by streams thus distantly and inconveniently situated to the inhabitants or cattle of the up-lands. A person of the neighbourhood, about thirty years since, devised the means of watering this tract by rills brought from the springs that break out at the foot of the far more lofty moorland hills that run parallel to and at the north of this tract, in some instances at about the distance of ten miles.

"These springs he collected into one channel, which he wound about the intervening tract, according to the level of it, and along the sides of the valleys, until he gained the summit of the arid country which he wished to water: having accomplished this, the water was easily conveyed to the places desired, and also to ponds in all the fields over a considerable tract of ground, in general falling with an easy and uniform descent to the south. In no instance it is apprehended that more than two rills have been required to supply the tract between each of these intersecting valleys; and frequently one channel has been found sufficient to convey the stream for several miles from its source; after which it forks off into two branches, to each of which more or less water is given, according as the country through which it has to pass may require a greater or less supply.

"The first of these rills is said to have been brought to Kirkby-moor-side about thirty years ago; since which time many others have been made. The original expense of each rill, which rarely exceeded 100*l.*, was defrayed by a subscription, proportioned to the benefit each person was to receive; and they still continue to be supported by the same means, though in one instance, in a late act of parliament for the inclosure of a lordship through which one of these rills is conducted, a rate is laid on the land benefited by it, and means prescribed for compelling, if necessary, the future payment of it."

It is well observed, that the "plan for thus watering a dry up-land country has much merit: it affords a wonderful accommodation to the occupier; increases greatly the value of the property; and though not applicable generally, might certainly be adopted with great advantage in various other situations."



verdure; thereby affording the fullest proof of what improvement might be effected by the judicious application of this fluid. It is not, indeed, improbable but that, by the aid of machinery, water may be forced up so as to be dispersed at such levels as cannot at present be easily conceived.

The same principles may be applied, in many situations, in conveying the rich liquors collected in ponds and reservoirs about the farm-yards and buildings, that are too frequently wasted by evaporation or other means, over the adjoining fields, as has been practised by Mr. Fenna, in Cheshire, and described in the second volume of Communications to the Board of Agriculture.

The chief objection to this method of improving meadow lands is the first expense of the business; but if it be conducted in a judicious manner, this will seldom form any real impediment, as the almost immediate increase of produce will amply repay the improver. And the object of the cutting of the land is of little or no consequence, if it be thereby made to afford additional supplies of food for the support of stock, and at the same time contribute to the gradual improvement of the soil.

As the water in these cases is in a constant state of motion, it is not probable that any prejudicial effects should be produced on the health of the inhabitants, though the practice should be conducted on the largest scale.

*Warping*.—There is a mode of improving land by *warping*, or the admitting of the tide waters of large rivers near the sea upon the lands for the purpose of depositing their rich materials, which are denominated warp, and in that way forming as it were a new soil. It is much practised in some parts of Lincolnshire as well as Yorkshire, and has been fully described by Mr. Young in his valuable Report of the first of these districts. But as it can only be employed with advantage in a very slight degree upon grass lands as a manure, and as its application has been already considered in the management of tillage ground, it does not appear necessary to describe the practice more fully in this place.

*Mowing of Hay Lands*.—In the cutting of grass crops for the purpose of being converted into hay, it is necessary that they be in the most suitable states of growth and maturity for affording the best and most nutritious fodder. With this view, it would seem that they should neither be cut at too early a period, or suffered to stand too long; as in the former cases there will be considerable loss in the drying, from the produce being in so soft and green a condition, and in the latter from a large proportion of the nourishing properties being expended. It is probable, therefore, that grass, when mown before it becomes in full flower, while the rich



saccharine juice is in part retained at the joints of the flower-stems, is in the most proper condition for being cut down, as at that period it must contain the largest proportion of nutritious material, but which then begins to be absorbed and taken up in proportion as the flowers expand and the seeds ripen, so as to constitute the meal or starch of the seed-lobes, and is either dispersed upon the land or fed upon by birds, the grass-stems with their leaves being left in a similar situation to that of the straw of ripened grain.

But there are other circumstances besides those of ripeness to be attended to in determining the period of cutting crops of grass; as in some cases, where they are thick upon the ground, the bottom parts become of a yellow colour before the flowering fully takes place: under such circumstances it will always be the most advisable practice to mow as soon as the weather will possibly admit; for if this be neglected there will be great danger of its rotting, or at any rate of its acquiring a disagreeable flavour, and of becoming of but little value. Where grass is very tall, as is often the case in moist meadows, it is liable to fall down and lodge, by which the same effects are produced. In this case also the mowing should be performed as soon as possible.

But where there is nothing of this sort, it appears evident that the most proper time for performing the business is when the grass has begun to flower, before the seed-stems become hard and wiry; as at this period it would seem to contain the largest proportion of useful matter. Besides, when let stand too long, the after-grass is not only less abundant, but there is great loss by the crumbling down of the stems in the different operations of hay-making\*. The usual time of cutting for hay in the first crop is from about the middle of June to the beginning of the following month, according to the nature of the land, and as the district is more early or late.

In the operation of mowing, the chief art consists in cutting the crop as close to the surface of the ground as possible and perfectly level, pointing the swaths well out, so as to leave scarcely any ridges under them.

In cutting rowen, or second crops of grass, more attention in these different respects will be requisite than in the first, as the crops are mostly much lighter and more difficult to cut, the scythe being apt to rise and slip through the grass without cutting fairly, except when in the hands of an expert workman. Crops of this sort should always be cut as much as possible when the dew is upon them, and as soon as ever there is a tolerable growth, as by waiting, the season is constantly getting

\* Corrected Report of Perthshire.



more unfavourable for making them into hay; and when not well made this sort of hay is of little or no value.

The quantity of ground that can be mown in any given space of time must depend, in a great measure, upon the weight of the crop and the capability of the workman, but in general an acre is considered as a full day's work for a good mower.

When the grass has been decided to be in the proper condition for being cut down, a set of mowers, proportioned to the extent of the crop, should be immediately provided. In some districts it is the custom to pay these labourers by the day, but a better and more general practice is to let the work at a certain price by the acre. A suitable number of hay-makers are likewise to be obtained; in some cases two or three are deemed sufficient for each mower, but in this district the usual number, including pitchers and stacker, is about five, who proceed with their work after the mowers, and are paid by the day. In hot or windy seasons a larger proportion will be necessary than when the weather is cloudy and cool. About one half may be women. If a due proportion is not preserved, much inconvenience and disadvantage will arise in having too much cut grass on hand to be perfectly managed.

*Hay-making.*—The great art in converting grass into hay consists in rendering it sufficiently dry to prevent its taking on too great a degree of heat in the stack or mow, and at the same time preserving a large proportion of the natural juice of the plants. Where this medium can be attained with the most exactness, the best and most nutritious hay will be produced. It is, however, a difficult point, that requires much care and attention. In fine seasons the great danger is of not making it sufficiently, while in those of the contrary description it is apt to be made too much. This is fully evinced by the great inconveniencies that are frequently sustained from the heating of the stacks in the former cases, while in the latter it is but seldom heard of.

It has been suggested by an accurate observer, that in the making of hay "some attention should be paid to the quality of the soil and the kind of herbage growing upon it. The hard benty hay of a poor soil is in little or no danger of heating too much in the stack; it should, therefore, be put very early together, in order to promote a considerable sweating, as the only means of imparting a flavour to it, which will make it agreeable to horses and lean cattle, as it will be nearly unfit for every other sort of stock. It is the succulent herbage of rich land, or land highly manured, that is most likely to generate too great a degree of heat; of course grass from such land should have more time allowed in making it into hay. In moderately hot seasons the proper point of drying may be easily judged of; but when



they are very hot and scorching it is easy to be mistaken; as in such weather the grass becomes crisp, rustles, and handles like hay, before the moisture or sap is sufficiently dissipated for it to be in a state fit to be laid up in large stacks. If that, however, be done when it is thus insufficiently made, it mostly heats too much, becoming mow-burnt in some cases\*."

There is another circumstance, which though difficult in many cases to be performed, is of much consequence; this is that of "carrying the whole of the hay just at the moment it is sufficiently made; which is necessary in order to its yielding the greatest possible weight, and preserving its best quality; as every minute after that precise time it continues to lose, both in weight and in its nutritious properties, by evaporation," as is evinced by the smell. "Even the difference of an hour, in a very hot drying day, is supposed to occasion a loss of 15 or 20 per cent. on the hay, by its being carried beyond the point of perfection, and frequently even a greater loss is sustained†."

The art of hay-making has been observed to have been brought to a degree of perfection in this district altogether unequalled by any other part of the kingdom. The neat husbandry and superior skill and management, so much and justly admired in the arable farmers of the best cultivated districts, may, with equal justice and propriety, be said to belong in a very eminent degree to the hay-farmers of this part of the island, as they may very fairly claim the merit of having reduced the art of making good hay to a regular system; which, after having stood the test of long practice and experience, is found to be attended with the most perfect success. Even in the most unfavourable seasons the hay made according to this method is superior to that made by any other under similar circumstances. It is, therefore, to be regretted that this very excellent practice has not yet, except in a very few instances, travelled beyond the limits of the county. But as it highly deserves the attention and imitation of farmers in other districts, we shall describe the whole process, from the moment at which the mower applies his scythe, to that in which the hay is secured in the barn or stack‡.

The chief part of this sort of labour is performed by means of small forks made for the purpose.

In the first day's process all the grass mown before nine o'clock in the morning is tedded or spread out, great care being taken to shake it so as to leave it free from lumps, and to strew it evenly over the whole surface of the ground. It is soon afterwards turned, with an equal degree of care and attention; and if the number of

\* Middlesex Report.

† Ibid.

‡ Middleton's Report of Middlesex.



hands be sufficient they turn the whole again, or at least as much of it as they can before twelve or one o'clock. It is then raked into what are termed single windrows, or so as that each person may form a row at about three feet distance; and the last operation of the day is to put it up into grass-cocks. The business of the succeeding day commences with the process of tedding all the grass that was mown the first day after nine o'clock and all that was mown this day before the same hour. The grass-cocks are then well shaken out into what are called staddles, which are separate plats of five or six yards in breadth. Where the crop is so thin and light as to leave the spaces between the staddles rather large, they are immediately raked clean, and the rakings mixed with the other hay, in order to its all drying so as to be of an uniform colour. The staddles are next turned, and after that the grass that was tedded in the first part of the morning once or twice, in the same manner as described in the first day. This business should all be performed before twelve or one o'clock, that the whole may lie to dry while the people are at dinner. After this the first thing is to rake the staddles into double windrows, which is done by every two persons raking the hay in opposite directions or towards each other, forming a row between them of double the size of the single windrows, each being about six or eight feet distant from the other. They afterwards rake the grass into single windrows; then put the double windrows into bastard cocks; and conclude by putting the single windrows into grass-cocks. The labour of the third day is begun by first tedding and spreading out the grass mown and not spread the preceding day, as well as that mown in the early part of this day, and then the grass-cocks are thrown out into staddles as before, and the bastard cocks into staddles of less extent. These narrow staddles, though last spread out are first turned, then those which were in grass-cocks, and lastly the grass is turned once or twice before twelve or one o'clock. When the weather has been sunny and fine, the hay which was last night in bastard cocks will this afternoon be in a proper state to be carried, as in fine seasons it may mostly be performed on the third day; but when the weather has been cool and cloudy, no part of it probably will be fit to carry. In that case, the first business after dinner is to rake that which was in grass-cocks last night into double windrows; then the grass which was this morning spread from the swathes into single windrows. After this the hay which was last night in bastard cocks is made up into full sized cocks, and care taken to rake the hay up clean, and also to put the rakings upon the top of each cock. And lastly, the double windrows are put up into bastard cocks and the single ones into grass-cocks, as in the preceding days. On the fourth day the great cocks just described are mostly carried before dinner. The other op-



rations are similar to those of the former days, and proceed in the same order, continuing them daily until the whole is finished,

During the whole course of hay-making the grass should, as much as possible, be protected both in the day and night against rain and dew by cocking\*.

In districts where the hay season is later and the weather more changeable, it would often be dangerous to expose the hay so much abroad as in the above process: a more cautious method should probably be adopted. In such cases, instead of keeping the hay almost constantly spread out and exposed to the atmosphere, as in the preceding method, it may be better to put it into small cocks soon after it has been cut down and become a little made; these should then be frequently turned over but not spread out, except when the weather is in such a fine state as to insure their being put up again in the same state, without injury from the falling of rain†. This method is much more slow, though the hay is less exposed to danger in wet weather, than in that which has been described above; and when there is much heat it may be made with little trouble or expense, and without much expenditure of its nutritious juices.

Another practice that has been found useful in such situations is, to break out the grass that is mown, turn and windrow it the first fine day, and also to put it into small cocks when the ground is dry; on the next fine day a few of the cocks are broken out at a time, and kept constantly turned till fully dry. Three or four of them are then put into one cock, the work proceeding in the same manner till the whole is done. And when the weather is bad these cocks are never re-broken out, being only lightened up to let the air pass through them more freely.

The advantages in the first mode are supposed by some to be, that from the regular tedding that is given the hay becomes of a more valuable quality, heats in the stack or mow in a more uniform and equal manner, and cuts out better in the trufs.

It is likewise well observed, that no more of the produce should be thrown abroad than can be put up into cock the same day, or before it is injured by the fall of rain. When the weather is unsettled, it may often be permitted to remain in the swath for several days, only taking care that the undersides do not become discoloured by turning them over by the head of the rake. In this way it will frequently be so much made, in a few days, as to require little tedding afterwards to form good hay‡.

\* Corrected Report of Middlesex.

† Modern Agriculture, Vol. II.

‡ Middlesex Report.



The preserving hay of a proper green colour is a circumstance of some importance. In order to effect it the bastard cock, previous to their being carried, should be put up in the heat of the day and remain in that condition till the following morning, when they must be turned and opened so as to dispel any damp that might induce it to heat in the stack, and in that way spoil the colour\*. The acquisition of a lightish brown colour in the stack is not found injurious to hay, but where it becomes of a *dark* brown from too much heat, it is said to weaken and relax horses that are fed upon it by its powerful diuretic quality. It is of course of inferior value.

The *rowen*, or second crops of hay, from their being slender, having fewer succulent stems, in most cases require less time in being made into hay than the first. In securing this sort of hay it is, however, advantageous to have it well made, as without this it will be very liable to grow mouldy in the stack and become of a bad colour from taking on too great a degree of heat, as the less it heats in the stack the more green the colour will be.

*Stacking and Thatching Hay.*—In performing this business it is always advisable to have staddles made for the purpose, somewhat in the same manner as those that have been recommended for grain, though it is too common a practice to build hay-stacks without ever attending to this circumstance. They need not, however, for this use be raised so high or have any shelving outwards, but be quite plumb and without copings. In the common method of placing them upon the ground, on a little drift, or a few pieces of wood laid across each other, there must constantly be great loss in the bottom parts of the stacks from the moisture being absorbed by the hay; but by the use of staddles this may be wholly avoided, and the expense will be but a trifle, as any old rough pieces of wood will answer the purpose.

In respect to the form of the stack it is not a matter of much consequence, the long square, or oblong shapes are the most safe and convenient, especially when not too broad, as they admit the air the most fully. Besides, they are the most convenient to cut from in trussing hay for sale. But the circular form for farm use, where straw is scarce, may be the most advantageous in the economy of straw in thatching.

The size of the staddle or stack bottom should be proportioned to the quantity of hay, but it is better not to have the stacks too large; twenty-four feet by fourteen or fifteen is for most occasions a good size.

The business of stacking hay is best performed, if possible, while there is a full

\* Middlesex Report.



sun, especially when the season is indifferent, as by that means it is much improved. It is necessary to have a person that understands the art of setting up stacks, and a sufficient number of helpers to assist in spreading the hay and treading it well down. In building, the middle of the stack should always be well kept up, something higher than the sides. In this district, where work of this sort is well executed; at leisure times, during the whole period the stack is building, the men are employed in pulling the sides and ends into proper form. And it is common to have a large sail cloth raised on poles, which covers the whole and prevents its being injured by rains until it is finished.

In order to prevent the hay-stacks from heating too much, holes, pipes, chimneys, and other contrivances are sometimes formed in the middle of large stacks to draw and conduct off any superabundant heat. It is better, however, to avoid these as much as possible, as the hay round them is always much injured by attracting the moisture of the stack.

In building the upper parts of stacks of hay, corn, or other materials of a similar nature, some contrivance of the *stacking stage* kind is necessary, in order to enable workmen to pitch the substances with convenience to the person who stacks them. The common method of performing this is by means of a framed stage, set upright, sufficiently near the stack to suit the workman who pitches the hay or grain to it. But a stage of this sort which appears to be better contrived, and which is more simple and cheap, is described by Mr. Young in his excellent Report of the Agriculture of the County of Suffolk. It is suggested that this stage may also be employed for nailing up weather-boarding, painting the outsides of buildings, plastering of walls, and several other purposes of the same kind.

After the work of stacking has been completed, and the stack is pulled and topped up, it is left till it has sweated and is perfectly settled, which is mostly the case in a week or ten days: the roof should then be well covered by a good coat of thatch, secured by means of a straw rope, extended along the eaves across the ends and on either side just below the ridge. This rope is usually secured by means of pegs. The roof should be dry when the thatch is put on to prevent the hay from becoming mouldy. It is of great consequence that this sort of work be well performed, the farmer should of course always have attention to it, as labourers are often apt to slight it.

It is a point not perfectly decided among agricultors, whether hay keeps better in stacks in the open air or in barns for the purpose. It is the opinion of most farmers in the southern districts of the kingdom, that the first mode has the advantage in so far as respects the quality of the hay.

In many of the more northern parts of the island the hay is, however, secured in



the barn, and has appeared, in all the examinations we have made, equally good and sweet with such as has been preserved in stacks in the open air. And the trials of Mr. Middleton, as stated in the Middlesex Report, seems to support the same supposition; as in securing hay in his barn, without clearing it from the quartering on the sides, he found on cutting and binding it up, that it was equally good in quality with that from the stack-yard, and as perfectly free from dust. The hay was made without rain, and that which was the least made put in the barn.

Barns are observed to have other advantages, being “extremely useful and convenient during a catching and unsettled hay-harvest, and also at other seasons of the year. In wet and windy weather they afford an opportunity of cutting, weighing, and binding hay; none of which operations could at such a time be performed out of doors.” All the farmers who were consulted on the subject “agreed, that hay might be put together earlier, even by a day, in a barn than it would be safe to do it in a stack.”

In answer to objections made on the grounds of the practice not repaying the expense of large barns, it is remarked, by the same writer, that it is “in direct opposition to the opinions of the best hay-farmers in the country, and contrary to his own experience. For in the driest seasons barns are a saving of four or five shillings an acre; and, in wet seasons, the ready assistance which they afford in speedily securing the hay, has been known to make a difference in price of twenty shillings per load on a small number of loads.”

There are other advantages in the use of barns for this purpose, as there is not only less litter and waste, but, in merely hay districts, a great saving in straw, which is now an expensive article in many places, especially near large towns.

But without having recourse to the erection of expensive barns, many of the conveniences and advantages of them, especially those of saving the labour and expenses of thatching, may be obtained by the use of covered sheds, raised on pillars or posts, and open on all the sides. These may be constructed in a cheap manner by having the roofs made with thin feather-edged boards, well payed over on the outside with tar or paint. These are light, cheap, and will last a great length of time by care in keeping them well painted\*.

\* The expenses of mowing and making the hay in the first method, carrying, stacking, thatching, and other necessary operations, are thus stated by the author of the Report of Middlesex:

| <i>Expenses per Acre.</i>                                       |  | <i>£.</i> | <i>s.</i> | <i>d.</i> |
|-----------------------------------------------------------------|--|-----------|-----------|-----------|
| Mowing 3s.—beer 6d.                                             |  | 0         | 3         | 6         |
| Making and stacking                                             |  | 0         | 9         | 6         |
| Pulling the stack, and laying the hay pulled out upon the stack |  | 0         | 0         | 6         |
| Horses, harness, and carts                                      |  | 0         | 2         | 0         |
| Straw for thatch 3s. thatcher and labourer 6d.                  |  | 0         | 3         | 6         |



On some hay-farms the dependence is chiefly upon the sale of the article, which is conveyed to the market after being cut by a knife, and bound up into trusses, weighing fifty-six pounds each, thirty-six of which form a load, or about eighteen hundred weight; but when sold fresh from the field, twenty hundred weight constitutes the load\*. When the hay has been preserved in a perfectly good condition, there should not be the smallest waste in the binding; the loose parts being put in the middle of the trusses and the bands twisted from the long coarse parts.

The quantity of produce obtained from an acre of grass land must be different according to the fertility, management, season, and other circumstances; but from one to two loads is the usual proportion.

For the purpose of facilitating the business of getting the hay together in bad showery seasons, *hay-sweeps* and *sledges* have been constructed.

A contrivance of the first sort has been invented by Mr. Middleton, which seems to be possessed of merit. It is so constructed as to be drawn by four horses in pairs, but smaller ones might be made to be drawn by two, and is managed by two boys, one of whom drives each pair of horses, being mounted on one of them. Where the ground is level, little more will be necessary in order to assist the machine than merely to break and turn up the rows of hay in different places; but where the ridges are high, and there are considerable inequalities of surface, it will be requisite to assist the implement by occasionally sticking the prongs of a fork into the still hay just before the machine, that it may more effectually catch it.

In Yorkshire another sort of contrivance, termed a *hay-sledge*, is employed for the same purpose, and in some situations is probably to be preferred; as where the land is dry, the ridges high, and the ground irregular in the surface. With this machine and two horses the hay may be collected together, loaded, and carried to the stacking place, in much less time than by means of a cart. In loading it, the hay is first to be raked into rows, when the sledge is brought to the end of one of them, and one of the horses made to pass on each side, until it has collected a sufficient quantity for a load, one of them then crossing the row of hay, the load is conveyed to the stack; when, by the horses being turned about, the sledge is drawn back, leaving its load behind it.

Since the period this statement was made, 1798, the expenses have increased very considerably.

It is added that "If the hay be put into barns, the last charge of 3s. 6d. will not, of course, be incurred; most of the third, and part of the second, will also be saved; so that the whole expense in this case will not exceed 15s. per acre."

\* Synopsis of Husbandry.



The most economical and advantageous methods of consuming this sort of fodder will be considered when we come to speak of the different modes of managing live stock.

*After-Grass, or Rowen.*—In some districts much of the after-grass is frequently cut and made into a green soft sort of hay, in the manner that has been already mentioned; but in others it is fed off by live stock in the autumn. Both modes may be useful under different circumstances. In situations where plenty of manure can be procured, as near large towns; and where the chief dependence is upon the sale of hay, or where lamb suckling prevails, it may frequently be a beneficial practice to take a second crop of hay, as the first may by that means be more fully spared for sale, the after-crop supplying the cows or other cattle that may be kept on the farm. But in cases where manure cannot be easily obtained, and there is no local practice carried on that particularly requires such sort of hay, it is better to let it be fed off by stock than run the risk of exhausting and injuring the ground by the taking off repeated crops. There is also another circumstance to be considered in this business, which is that of the state of the land in respect to dryness; as where it is low, wet, and very retentive of moisture, it may be often more hurt by the poaching of the cattle in feeding off the herbage than by taking a second crop of hay.

Independently of these considerations, it may, however, in general be a more safe and useful practice to eat off the after-grass by stock, and only take one crop of hay, as by such means a more abundant annual produce may be afforded and the land sustain less injury\*.

Where a crop of rowen is made into hay, the most profitable application of it is probably in the foddering of such cows as are in milk, as it is well suited, by its grassy quality, and its not heating so much when well made as other sorts of hay in the stack, to afford a large flow of milk. It is this reason that induces the cow-farmers to cut their grass so many times in the summer. Another beneficial application of this hay is in the feeding of such ewes as are employed in the suckling of house-lambs during the winter season; the intention in this case is the same as in that of the preceding instance. There is another advantageous use to which this sort of produce may be applied, which is that of supporting young calves and all sorts of young cattle that are kept as store stock.

Where sheep require the support of hay in the winter season, it is also well adapted to that use.

\* Corrected Agricultural Report of Middlesex.



Where after-grass is fed off by stock, there is much difference of opinion in regard to the most proper periods of turning in the animals. Some have contended that it is the best practice to let them into the field before the young grass has attained any very great head; while others maintain the opposite doctrine, and think it the best method to allow the grass to get up to a full bite before the stock is turned upon the land. Both endeavour to support their opinions by experience. But as they cannot be both of them true, it is probable that the extremes of each are to be avoided; and that, as in many other matters, the truth may lie in the middle. This is indeed equally supported by fact and the observation of the most intelligent managers; as when the cattle are turned in too early there is not a sufficient bite to keep up the condition of the animals; while in the contrary extreme, the stock so soon fill themselves that much of it is trodden down and wasted afterwards in their roaming about the fields to pick the sweetest morsels. In confirmation of this opinion, Mr. Marshall found in the midland districts that milch cows fell off in milk, and bullocks in flesh, on being put in too early, before there was a sufficient bite. This he, however, seems to consider as arising from the want of nutritious quality in the grass in this state. And the incautious observation of common farmers has ascribed it to the inconvenience the animals sustain in feeding from the stubs. It is not, however, probable that either is the case; for as soon as the scythe has separated the old grass from the roots, new shoots are made that are highly sweet and nourishing. This may be easily perceived to be the case on examining a piece of ground soon after its being mown, and tasting the young shoots. The supposition respecting the stubs is shown to be founded in error, from the circumstance of the stock devouring the herbage with avidity, as Mr. Marshall has well remarked. Besides, the animals lick in their food by the tongue, which is armed for the purpose before it is bitten, and do not push their noses so as to be inconvenienced by the stiffness of the cut grass-stems. It is possible, however, that some effect in lowering the condition of the stock may arise from the laxative effect that may at first be produced on the animals by such young succulent grass.

Where much stock is turned upon after-grass in a full state of growth, there cannot be any doubt but that much loss must, as has been just observed, be sustained by the treading down and rendering the grass unfit for being eaten off. This is sufficiently evident on viewing fields fed in this state.

It is therefore perhaps only by beginning the pasturage of after-grass when in the middle state of growth that it can be consumed to the best advantage, and without loss in either of the ways that have been just noticed. This practice seems to be



countenanced by the observation of an agricultor who has had much opportunity of information on the subject\*.

The manner of feeding down after-grass varies much in different districts; it has been observed by a farmer in Middlesex, that the condition on which he rents his farm is that of taking out the heavy cattle at Michaelmas, but that sheep remain till February: in this county the practice is to turn on the cattle immediately after mowing. But in the northern districts this grass, to which they have given the name of eddish, is kept till November or even a later period for the purpose of finishing fat stock, or for the pasturage of milch cows, from which a superior quality of cheese is made, and by which time it has attained a considerable head: however, this latter practice would seem to be attended with some loss, from its being trodden and trampled under foot as may be readily perceived by examining the field.

In the stocking of after-grass, some attention is necessary not to have too great a number of animals on a given proportion of land.—To overstock produces injury in various ways, especially on first turning in, but particularly by too much treading and beating down the grass. Mr. Marshall found the midland graziers of opinion, that one cow to the acre on well grown after-grass was an ample stock. Good grass-land may, however, admit something more.

In the pasturing of rowen, or after-grass, by heavy cattle in the autumn, great injury has been complained of from their poaching the ground, particularly at a late period in that or the winter season. On this account it has been recommended to confine the consumption of this grass principally to the support of sheep, unless in very favourable seasons, or where the soil is uncommonly dry, in which cases milch cows or other heavy cattle may be admitted without inconvenience†.

It is the practice in cases where there is a great scarcity of spring feed to reserve after-grass in the autumn for spring use. Some on the basis of experience contend that it is the most certain, and, on the whole, the best spring feed yet known. This would seem however to be a wasteful practice, at least in respect to the more forward after-grasses. The forwardest ought certainly to be eaten without waste, before winter sets in; and the latest, that is to say the shortest, may be shut up for spring feed. If after-grass be too long and gross, it is apt to lodge and rot upon the ground in winter; therefore on rich lands, it should always be more or less fed off before Michaelmas, in order to prevent its being wasted or lost in the winter. An expe-

\* Marshall's Rural Economy of the Midland Counties.

† Wilkinon in Commercial and Agricultural Magazine, Vol. IV.



rienced agricultor found, from repeated experiments, that old after-grass feeds sheep that give milk better than turnips, which are more adapted to the fattening of stock; and that this grass holds to a period, if wanted, when most other resources fail, the last half of April, and the first half of May—periods always of want and difficulty, where rye grass is not sown\*. Mr. Marshall also assures us, that as a certain and wholesome supply of food for ewes and lambs in the early spring, the preserved pasture is to be depended upon as “the sheet-anchor”, in preference to turnips, cabbages, or any other species whatever of what is termed spring feed.

The same thing has been experienced by Dr. Wilkinson, who has observed that this food with him afforded a more nutritive and healthful quality of milk from the ewes to their tender lambs than turnips, even in their best state.

But however useful after-grass pastures may be under this management, there is evidently a great loss of food incurred by it, especially in severe winters: it would therefore seem to be frequently the best practice to eat after-grass well down, as late as possible in the autumn, by different sorts of live stock, and depend in a great measure upon the new grass for spring feed.

It has been suggested that mowing the preserved after-grass in the winter, and giving it to the stock in the farm-yard, might be advantageous in preventing the land from being poached, and the useful long grass from being trampled down and destroyed †. The trouble and expense of the process would perhaps in general be too great, though in particular circumstances, as where other sorts of fodder do not bear a proportion to the quantity of stock to be kept, and where sheep are conceived improper, it may afford some convenience and benefit, especially where it can be performed without injury to the ground by poaching, in the conveying away the materials which can seldom be the case except where the land is very dry; in which situations there is rarely much after-grass for this purpose.

Where the nature of the soils is such as not to admit heavy cattle, early and late lamb-suckling may often be carried on with advantage, as well as the feeding and fattening of other sorts of sheep, which is frequently the case in this district.

*Pasture Lands.*—Having in the preceding pages explained the different methods of management that seem necessary in the cultivation of those sorts of grass lands that are chiefly applied to the purpose of producing hay, we shall now describe the modes of practice which appear requisite in such as are almost wholly appropriated to the support and fattening of live stock!

The grounds that are the most perfectly adapted to this use are, all those which have a considerable depth of good mould, and at the same time that they afford a

\* Young in Annals of Agriculture. † Lawrence in Commercial and Agricultural Mag. in Vol. IV.



good herbage are so dry in their nature as to admit the animals to feed upon them at almost all seasons without injury by poaching. Coarse rushy lands may, however, in many cases be converted into good pastures, by proper attention in draining, and cutting over the rushes in the early part of the spring, as by this means the water enters their stems and the plants decay, the young shoots being afterwards eaten by young stock, and the good grass plants allowed to flourish. There is also another sort of land that may be employed in this way, which is that of the moory kind, consisting of much imperfectly reduced vegetable matter proceeding from the leaves and roots of various decayed vegetable productions, that require to be brought into a suitable condition for the support of grass plants by proper drainage and the application of substances of the fossil kind.

Pasture lands should likewise, as much as possible, possess properties in the nature of their grasses that are the most advantageous for the particular method of management under which they are to be conducted. In this view, some may be more adapted to the producing of milk or butter, others of cheese, and others again of feeding or fattening animals. It is in some measure on this account, as well as that of local convenience, that different modes of management are employed on grass lands.

The difference of situation in pasture lands has likewise much influence in directing the uses to which they may be applied with the greatest benefit. The higher or more elevated grounds being in general more proper for sheep, while those of the lower and more inclosed kinds are mostly better suited for the purpose of neat cattle or other animals under the fattening system. And besides, the age of the lay makes a difference in some cases; new laid down pasture lands being commonly found more proper for the support of the young store animals, while those that have been long in the state of sward are in general better adapted to the feeding or fattening stock.

The mode of inclosing has also some effect in the same way; as when the inclosures are of a moderate size, they are found more suitable for the purposes of feeding than where the contrary is the case\*.

This sort of grass land, as well as that of the hay kind, is subject to be overrun and much injured in its produce both by moss, coarse plants, and ant- as well as mole-hills. These should therefore be constantly removed, or spread about as soon as possible, and prevented from obstructing the complete pasturage of the lands in the manner that has been recommended above.

On the marsh grazing lands in Kent, where ant-hills frequently occur, they have a mode of extirpating them in an easy and expeditious way, and of bringing the surface level, which is by the use of an implement, eight or nine feet in breadth,

\* Corrected Report of Perthshire.



which is armed with a sort of strong cutting blade. When in use, it is drawn by a horse directed by a boy, and guided behind by a man, and is capable of often cutting off several of the hills at one stroke, and of course of clearing a number of acres in a very short space of time. There are various other ploughs in use for this sort of work.

But, besides these, pastures when not well attended to are frequently prevented from being properly fed, by various kinds of low shrubby plants, such as those of the alder, brier, broom, furze, and other sorts that shoot out upon the surface, and which should always be extirpated as soon as the business can be conveniently done; as by their remaining upon and shading the ground they render the herbage sour, and improper for the food of cattle. This sort of work may be performed by cutting them closely down as they rise in the early spring months; but a better practice is to dig them or plough them completely out, in the manner that has been described in speaking of the methods of bringing lands into the state of cultivation\*. The shrubby, black, and other thorns and briars that spring up from suckers on the sides of the hedge-rows of pasture grounds, should likewise be exterminated, especially where sheep are pastured, as they do great mischief by pulling and entangling their coats. Besides, much ground is often lost in this way, and the appearance of the hedges is disgusting. In many cases after the plants are stocked up, the earth about them might be thrown up into a compost with a small proportion of well rotted dung, and spread upon the land with much benefit; and at the same time the land thus cleared be brought into a proper condition for being sown down with grain seeds.

Where pastures are productive in grasses of the more sharp coarse bladed kinds which rise into tufts or tussocks, and which are known to agricultors under the titles of pink or carnation grasses, and there are other sorts of aquatic plants presenting themselves, it is a certain indication that the soil is too retentive of moisture, and not only stands in need of draining, but also of being kept in a close state of feeding by different sorts of stock.

The manuring of pasture lands is a business much less in practice than ought, perhaps, to be the case, as where the soil is not good, and they are kept in a constant state of feeding or pasturage, it would seem probable that their fertility must in some measure decline, if proper means be not taken to preserve and keep it up, even though they should be fed down with sheep, which is unquestionably in this view the most favourable sort of stock. It is indeed hardly to be supposed that the small proportion of excrementitious matter that is dropped at random during the feeding of the animals, especially the larger kinds, under an exposure to the dissipating and washing effects of the atmosphere, at different seasons, where no other sorts of food

\* Section on the Cultivation of Arable Land.



than that of the natural grass of the pastures is consumed, can in such sorts of land be adequate to the restoration of the great degree of fertility that is constantly conveyed away in the time of pasturing. In the better kinds of pasture lands, where the produce of grass is considerable, improvement may, and undoubtedly does, take place by feeding them, especially by sheep, as the discharges of the animals are not only more abundant, but a proportion of old grass is left to decay during the winter season, and in that way make an annual addition to their fertility. It appears probable to me, however, it may differ from opinions that have been held on this subject by some cultivators, from much close attention to the management of grass lands of the less rich kinds in the state of pasture, that in such cases, unless attention be paid to improve their condition by some other means than merely that of the manure dispersed over the land by the animals in simply consuming the herbage, that they must in time become gradually deteriorated, and the quantity of pasturage be lessened so as to support smaller proportions of stock than was formerly the case. This supposition seems indeed, in some degree, supported by the condition of downs, and other uninclosed lands that have been in a state of pasturage for a great length of time; as in these cases, if feeding had rendered them more fertile, they must long since have been enabled to carry a vastly increased proportion of stock; which is certainly not the case\*.

That feeding down pasture lands, of these as well as other kinds, in a judicious manner has the effect of rendering the herbage more fine, and better for the support of stock in general, there cannot be the smallest doubt; but it does not certainly follow that the fertility of the land, in such cases as have been just mentioned, is thereby really improved, as has been supposed by some employed in the business of grazing in particular situations and circumstances. Where the pastures, as has been just observed, are in such heart as to afford a large quantity of herbage for being converted into manure, and sufficient to permit a portion annually to revert to the state of vegetable mould by its undergoing the process of putrefaction, a considerable progressive improvement must, without doubt, be the case under the pasturing system, especially where sheep constitute the principal stock. And in most cases the fining of the herbage by this practice must be advantageous. It seems, therefore, not improbable but that the bettering of the condition of the herbage by feeding the lands with sheep may have occasionally led to the supposition that the fertility of the grounds was thereby, in *all* cases, really improved. That an increase of fertility is produced, in most instances, by the pasturing of lands with sheep, is not disputed; it is only in particular circumstances that the contrary is contended to take place. And in all cases the injury that may be

\* Anderson's Essays, Vol. III.



sustained in this way must evidently be very small, when compared with that which takes place from repeated mowing without the application of suitable dressings to the lands.

The improvement of the fertility of pasture grounds may be effected in different ways, as either by the direct application of manure in its natural state, such as that of rotten dung, lime, marl, or in that of earthy compost, occasionally over their surfaces in a thin even manner; or indirectly by the folding or confining of sheep upon the land during the time they consume other sorts of green food, such as turnips, &c. The latter mode is unquestionably the most advantageous and convenient, as it is in but very few situations that the former can be practised without injury to the arable or hay lands. By proper attention in this way the more poor pasture grounds might soon, and at little expense, be brought into a good state of pasturage; which could seldom or ever be the case without it.

The most proper period for turning the flock into the pastures in the spring season has been a matter of dispute among those employed in the management of grass lands; some contending that it should be done early, before the natural grass has risen to too great a bite, while others maintain the contrary opinion. There are probably inconveniences attending each of these extremes, as in the first the stock, especially when of the fattening kind, may sustain injury from the want of a sufficient bite to permit the animals to fill themselves in an expeditious manner; and in the latter there may not only be much waste by the stock not being capable of keeping it under, but great loss and inconvenience from its running up in tufts to feed, and by that means rendering the pastures patchy and unevenly fed down, by which the extent of real pasturage is lessened. It has been also observed, that by turning the stock upon the pastures when there is a full bite the better sorts of grasses are only consumed, the more coarse herbage being rejected and let run up to feed, by which the lands are greatly injured at the time as well as in future; while, on the contrary, if the stock be allowed to enter during the time such coarse plants are in their more tender early growth, and before the pasture is covered with better herbage, the whole of the other plants will be fed down in a regular manner with the grass\*. It is likewise remarked by the same writer, that the want of a full bite on the first turning out of store stock is of advantage to the animals, as they become more gradually accustomed to the change from dry food to succulent herbage. And it is supposed that fattening stock only require a full bite on being at first put upon the pasture†. In answer to the objection that has

\* Marshall's Rural Economy of Yorkshire.

† Ibid.



been made, that early turning upon pastures exposes them more to the effects of drought in the spring months, it is said that it is in a great measure ill founded, since cattle milk and thrive well in such cases. "It is not," Mr. Marshall remarks, "the length of grass, but the quantity of nourishment which it contains, that makes cattle pay for their pasturage." And it is not supposed improbable but that the richness of the herbage may in some degree depend on the sun or heat of the season\*.

As the state of grass which is the most favourable to the feeding of the stock, and their expeditious filling themselves and taking their rest, as well as that of their wasting the least possible proportion of the food, would seem to be that of a middle degree of growth, it is not improbable but that that may be the most proper and advantageous period for breaking the pastures; the exact time of which must obviously be regulated by the nature of the soil, the situation of the land, and the state of the season. From the end of March to the latter end of April, or beginning of the following month, according to the forwardness of the season, may be the most advantageous in the southern districts, but in those of the north it may be deferred a week longer or more with benefit.

In regard to the general eating down of pasture lands there is likewise much difference of opinion, some advising that it should be done in as close a manner as possible, others that this should never be the case. It would seem, however, that the closeness or degree of feeding that is the most proper should be directed by the nature of the grass and the time at which it is performed, as where the herbage is of the coarser kind and consumed in the autumnal season, it may be done much more closely than in the contrary circumstances, as such sorts of grass must always be improved by such close feeding, and no injury can be sustained at such seasons from the roots of the grasses being left so much exposed, which would be the case in the later spring or early summer months, from the constantly increasing heat at such periods.

The advice that has been given by an intelligent observer on this subject may in general be adopted with propriety, which is, to be cautious not to overstock, as by that means great loss may be sustained, as "land when fed too bare is apt to burn in summer and to be chilled in winter. Besides, the necks of the roots are so injured by very close biting that they do not afford so quick or free a spring to the succession of blade as there would otherwise be." But, on the other hand, it is not recommended to leave a long bite of grass on the land: a middle degree will suit

\* Marshall's Rural Economy of Yorkshire.



all lands the best, and afford the most benefit to the persons who occupy them\*.

By the too thin stocking of pastures, though loss may be sustained in their not supporting the proper number of animals, as well as from the injury which is done by the grass plants running so much up to stems, the broken grass, in such cases, can be mown when in sufficient proportion for hay; but the disadvantages of overstocking are scarcely capable of being repaired, as, besides the lands being often exposed to much injury by the crowns of the plants being so closely pared down, especially in the finer kinds of grass, the cattle from suffering a check in their feeding are long in regaining their former thriving disposition†. It has been well remarked, that almost the whole of the produce of pasture lands may in this way be often thrown away, and that it is an error that young farmers are extremely liable to fall into‡.

The medium degree of stocking, which has been advised above, is in general to be carefully adopted from the experience obtained upon the land. In the procuring of which it is best to begin by an under proportion of stock§.

It is the opinion of a writer of great experience, that the more various the kinds of cattle are that are fed upon the pastures at different times the better||. But it has not been shown on what principle this advantage depends. If the different modes of feeding in the different animals be attended to and minutely examined, it will be found that though some sorts may consume grass when in a more luxuriant state of growth than others, they are all fondest of pasturing on that which is the most sweet and tender. This is rendered extremely obvious by the observations of an attentive inquirer, who has found, that although horses “appear partial to particular patches of sward, he has never been able to discover any peculiarity in the soil or the herbage of such barely eaten spots.” It is supposed that they have been fed down by such animals at first in so close a manner merely by accident; but that afterwards they are kept in such a close state of feeding from “their peculiar sweetness,” depending on the “peculiar shortness of the herbage¶.” It would, however, seem more probable, from the circumstance of the animals being almost wholly directed by the taste in the choice of their food, that the sweet or tender nature of the herbage in these parts first induces them to feed upon and consume them in so close a manner, as well as the continuing the close eating them down afterwards. The same thing is observed to happen in the vicinity of preserved covers, with hares and rabbits, from their

\* Kent's Hints.

† Marshall's Rural Economy of Yorkshire.

‡ Ibid.

§ Ibid.

|| Kent's Hints.

¶ Ibid.



keeping spots of barley or other grain crops closely fed down\*. And sheep are well known to ramble over the whole of the pastures in order to nibble and pick out the most sweet and delicate morsels.

The feeding of neat cattle is, perhaps, less particular and delicate in this respect; but where not forced by hunger they mostly appear to fix upon such parts of the land as possess the most sweet and palatable herbage, rejecting the coarser spots where it is less tender and agreeable.

If the conclusion be therefore well founded, that stock of all sorts prefer the best, sweetest, and most tender herbage, it is evident that no mixture of animals can insure the even and regular feeding down of pastures, as they will in some degree be all attracted by the sweetest and most tender parts, and those of the more coarse four kinds be in consequence almost wholly rejected. An agricultor of great experience and nice observation has remarked, that in pastures stock naturally pick the most palatable grasses first, leaving the others to run up to bents; and though it is admitted that one sort may have a preference for one species of grass and another for another, there is no mixing the animals in such a manner as to prevent this circumstance from taking place. It is wholly impracticable to proportion each kind of stock in such a way to the species of grass that may be most agreeable to it, as to prevent the scarcity of one sort and the abundance of the other†.

These are therefore not only difficulties in the regular feeding down of pastures, from the cattle being more fond of some sorts of herbage than others, but also from the inability of the grazier to proportion them in a way that may fully answer the purpose.

These observations, at the same time that they show the difficulty of the business, convince us of the advantage and importance of keeping pasture lands regularly and evenly fed down, which is perhaps only to be fully effected by one sort of stock properly succeeding another, till the want of the finer sorts of herbage obliges them to feed upon those that are of a more coarse nature. In this, as well as other views, the fattening stock should be first turned into the lands and kept upon them so long as they continue to improve in a proper manner; these may then be succeeded by the older sorts of cattle that require to be brought into condition, and the more young store stock may consume the remainder of the grass, according to the intentions of the farmer. That great utility and advantage may be derived from often shifting the cattle by having recourse to a *head* stock and proper *followers*, there can

\* Marshall's Rural Economy of Yorkshire.

† Close in Communications to the Board of Agriculture, Vol. III.



be little doubt. The few writers that have touched upon the subject of grass husbandry have in general, indeed, recommended the practice as highly beneficial both in respect to the pasture and the stock. And Mr. Marshall, in his *Rural Economy of Yorkshire*, speaks of this being a defect in the grass land management of that district. The correct grass farmer should, therefore, be more attentive to this part of his management than is commonly the case, taking care that the changes of his stock are made in a seasonable and judicious manner.

This is probably a practice from which greater utility may be derived than that of permitting many different sorts of stock upon the ground at the same time, as, besides their not answering the intention of feeding the pastures down with more regularity and evenness, they are inconvenient and disadvantageous in other respects. For where the pastures are fed down with a mixed stock, the animals seldom thrive or fatten so well as where the contrary is the case. They are too much driven about and disturbed by the different kinds teasing each other, especially where horses and neat cattle are put together. A mixed stock is also improper in another point of view: many sorts of animals feed closer and more expeditiously than others; of course, when there happens to be any scarcity of feed, some of the kinds may be greatly injured from the want of proper support. The horse, like the sheep, feeds close and quick, while the contrary is the case with the cow: it would of course seem improper to mix horses with neat cattle in the pasturing of grass lands, though the practice has been prevalent in many places. It has indeed been observed, that sheep and horses may feed and thrive best together, both from the similarity of their manner of eating, and that of the former consuming the rich luxuriant herbage which springs in consequence of the manure dropped in the season, while the latter prefer the less vigorous but the more clean grass\*. It is a practice, however, that has sometimes been found useful, to mix sheep with neat cattle. The notion of deriving advantage from the mixing of stock, from the circumstances of some sorts having a greater dislike to feed near their own dung and less towards that of others, is probably not founded on just observation, as all animals have a fixed aversion to both their own and that of other animals, and none of them will feed near either till compelled by the scarcity of food. This aversion does not, perhaps, depend wholly on the dung, but is in some measure avoided in consequence of the grass becoming rank and coarse about such places.

As it is a matter of importance to keep pastures and grazing-grounds as even as possible, a proportion of stock fitted to produce this purpose should always be put

\* Corrected Report of Perthshire.



upon the lands. On the rich and more fertile kinds, where the grass springs quick and in greater abundance, more stock will be necessary to effect this purpose than where the contrary is the case. It has been found on the marsh lands in Lincolnshire, that where the most grass is left in the autumn the herbage is the coarsest and the worst in the succeeding year. In the extensive feeding tract of Romney Marsh, the close feeding system is also found to answer in the most perfect manner\*. These facts show the necessity of hard stocking on the richer descriptions of land. In other parts of the first of the above districts, on turning upon a full bite in the spring, they stock in such a manner as to prevent the grass from becoming coarse by running up to stem. The necessity of sweeping over the rough tufty parts by the scythe is thus avoided, except in very wet seasons†.

It is a practical remark of a cautious observer, on describing a field not sufficiently stocked, that, on the marsh just mentioned, the grazing farmers would be ruined if they suffered so much grass on their lands‡. And it seems to be a bad practice to allow the grass in pastures to advance to such a state as to require being swept over by the scythe, though it may be right to do it under such circumstances, in order to prevent the greater injury that might otherwise be produced.

It appears extremely probable, indeed, that by permitting the grass plants to run up to seed-stems, the pastures may sustain vast injury, not only by the exhaustion of the soil that takes place during the efforts of the plants to form and fill the seeds, but in consequence of their whole vegetative powers being directed to that purpose, from their sending forth few or no leaves. This is extremely evident in all the coarser sorts of grass plants, and fully explains the utility of keeping them closely fed down, as by such means a more abundant grassy herbage is provided for the support of stock. There are various observations that seem to support this opinion. Thus, it has been recommended to stock pasture lands in such a manner as will keep the grass in a young succulent state; as in this way there is a benefit, by the whole of the produce being consumed, and at the same time the stems of the grass plants are prevented from seeding, which exhausts the roots and the lands: the soil is of course preserved in a better state of fertility, more shoots are thrown out, the sward is rendered more close, and a more constant verdure kept up§. “The true principle of grazing,” in the opinion of the same writer, “is to eat *all*, and particularly at those seasons when vegetation is rapid, that it may not weaken

\* Mr. Young in Lincolnshire Report.

† Ibid.

‡ Boys in Annals of Agriculture, Vol. XIX.

§ Price in Annals of Agriculture, Vol. XXI.



the turf and soil, but, by keeping the grass in a young state, have the shoots more vigorous.”

As for the purpose of feeding the larger sorts of neat cattle, it is necessary for the grass to have grown to a pretty full bite before they are turned in, and of course numerous feed-stems to be formed; it seems not improbable, but that the superior benefit of feeding with sheep may depend upon the circumstance of their eating more closely, and thereby preventing such effects from taking place.

In the stocking of pasture grounds the growth of the grass should be particularly attended to, and the proportion of stock adapted to it; care being always taken to have a full proportion during the summer months, from May to August; a proper reserve being then made for the winter season\*. In this business the farmer should be as careful as possible to neither over or under stock, as by either means he must sustain loss and inconvenience.

There is another point, in respect to the eating down of pasture lands, upon which farmers differ very greatly in their opinions, each contending for the propriety of their practice on the ground of experience: this is that of giving the cattle, of whatever sort they may be, the whole range of the lands, however extensive, at once, or by having them divided so as to let them have the grass at different times in a fresh unbroken state. The question does not appear to have been examined in that view, or with that degree of attention which is sufficient to fully decide the matter; and there are obviously various circumstances, such as those of the inequality of grounds and stocks, which must continually operate against its being determined by the test of experiment. It should probably be divested of those advantages that may arise from the circumstance of inclosure, as drainage, shelter, water, &c. in order to be fairly ascertained, and be merely considered as to whether there may not be more economy or less waste in the consumption of the grass in one way than in the other? and whether it may not go further in feeding or fattening the stock in one method than in the other? As the animals will not, of course, remain upon the same spot, the difference in respect to the disadvantage that may arise from the trampling down and spoiling the grass in that way, must be pretty equal in both methods of proceeding. In the first mode there will, however, be more difficulty in proportioning the stock to the consumption of the herbage, as well as more trouble and inconvenience in tending it; which are circumstances of importance. In what regards the grass being eaten with greater freshness in

\* Price in *Annals of Agriculture*, Vol. XXI.



one case than the other, it is obvious that the consuming the herbage in a divided state must have what little superiority there may be, as each time the cattle are let into a new piece of grass it will be perfectly fresh; which in the contrary case can only be so at the first putting the animals in, as they mostly trample over the whole before they settle to feed quietly on any particular part. But there are other points of more consequence that seem to favour the feeding pasture lands in a divided state; such as those of the cattle not grazing so quietly in large herds as in such as are smaller; and where any disturbance happens, either from accident or necessity, the whole being disturbed instead of only a part. Besides, it is found, as has been shown above, that all sorts of stock, when duly proportioned to their pastures, thrive better in small than large numbers together, being less liable to tease and disturb each other.

The experience of a writer, who has examined grass husbandry with much minuteness and attention in different districts, would seem also, in some measure, to favour the same conclusion, while it shows the benefit of one sort of stock following another, as he advises that “in all cases where fattening cattle or dairy cows constitute a part of the stock; and where soil, situation, and water will admit, every range of grazing lands should have three divisions: one for the head stock, as the cows and fattening animals; another for followers, such as the rearing or other lean stock; and a third for being preserved in order to freshen for the reception of the principal stock\*.” And he is decidedly of opinion, “that whether the ground may consist of one, two, or a greater number of divisions, not a weed should be suffered to seed, or a tuft of stale grass to stand on it; but once, at least, in the summer season be levelled down by the scythe, as by such means weeds may be converted into nourishment, “and waste ground into after-grass.”

The practice of close feeding, as recommended above, may, in many cases, render this unnecessary, and at the same time afford a superior advantage to the farmer.

The proportions of stock of different sorts that can be properly supported on any given space of pasture ground must vary considerably, according to the natural goodness of the soil, the properties of the grass, and the differences in the sizes of the animals. There is likewise another circumstance which should be attended to, which is the length of time the land has been in the state of sward, as new lays are seldom capable of carrying so much stock on the acre as those of the older kinds. It is also a point that ought to be attended to, that these lays should be stocked as

\* *Marshall's Rural Economy of Yorkshire*, Vol. II.



much as possible with sheep. To give any statement of the number of animals that may be grazed on the acre would not only be useless, but be liable to lead the young farmer into error, as it must differ so greatly in the manner that has been just noticed. Besides, the proportion of different sorts of stock that is put upon the grazing lands, in different districts, will be seen when we come to speak of the manner of feeding or fattening animals at grass.

Lands employed for the purpose of pasture are frequently occupied by stock during the autumn and winter, as well as the spring and summer months: it is, however, only those of the very dry kinds that can be turned upon in the winter season, especially by heavy cattle; and it is probably, in all cases, a much better practice to confine that sort of stock wholly to the fold-yards at such seasons, as by suffering them to be turned upon the pastures there must be a great loss in the waste of manure.

It has been found an advantageous practice by some to shut up their pastures late in the autumn, according to the state of the grass and other circumstances, eating them down as close and evenly as possible previous to the stock being removed, and keeping them perfectly free till they are wanted for ewes and lambs in the early part of the year, or for cattle at a later period, as when the first shoots appear in the spring, which from being intermixed with those of the autumn, are supposed to afford more nourishment for the support of the stock than when either of them are eaten separately\*.

In fields that are pastured by cattle, care should be taken that all such plants as are hurtful to stock be completely eradicated, as much injury is often done by them to the cattle as well as the products which they afford. The plants most prejudicial in this way are those of the hemlock, henbane, nightshade and yew kinds. It has been observed, that while the grass is plentiful there is not much danger of their feeding upon such plants; but when it becomes scarce, and they are confined, it is likely to take place, especially in the spring season†.

*Drinking-Ponds.*—There is another circumstance in respect to pasture lands, that it is indispensably necessary to attend to, which is that of their being well supplied with water, as without having this in some degree at command, it is impossible that the stock can thrive well, or answer in the most perfect manner in other views. Where they are not therefore supplied by brooks or streams running through them, it will be necessary to have recourse to the forming of ponds, or pools, for the purpose in the fields. In situations where the natural stratum of clay is of considerable thickness, there is little diffi-

\* Marshall's Rural Economy of Midland Counties, Vol. I.

† Perth Corrected Report.



culty in the constructing of watering ponds so as to be perfectly retentive; but in loose porous soils the business is not executed without considerable art and attention. Even in clayey lands, except the ponds be kept constantly filled with water they are liable to become leaky. This has been supposed to depend upon the cracking of the clay by drought, and the perforations of worms, the basons being converted by such means into a sort of filters\*. These inconveniences are of course to be guarded against in their construction; which are partly effected by the proper application and puddling of the clay as the work proceeds, and the use of a coat of lime below it. It is of great advantage also, in preventing the clayey stratum from being injured by drought and the poaching of cattle, to have coverings of earth, coarse gravel, or small stones laid over the clay. The sides or parts of the ponds which are to admit the cattle to drink should be well sloped down, so as that they may enter with ease and the least possible injury to the bottoms of the ponds.

In respect to their situation, it is the most usual to make them at the bottoms of slopes or rising grounds; where after heavy rains a slight run of water may be conveyed into them, from some road, or other firm surface; many are, however, placed without any such assistance for filling, or with very little, it being found that the rain that falls upon their surfaces is in general sufficient for a supply, after they have been once filled†: but in many cases, as the expense is considerable, it would seem more advantageous to have them formed in the angles or corners, where two or three fields meet, as by this means one pond may serve the whole, and at the same time but little space of ground be taken up or wasted. It has been suggested as highly useful in the forming of these drinking-ponds, to have a waste-water place on the upper side of the main reservoirs, to prevent their being uselessly *silted* up when full by the muddy water continuing to run into them; as by its changing from a running to a stagnant state a considerable deposit takes place, which might thus be avoided‡. Much mud would also be collected in this way, in many cases, and be removed with little trouble; which renders them of great utility in procuring manure.

It has been observed that “the best season for making these ponds is thought to be in autumn, as they are then likely to be filled the soonest, and the least liable to crack before they are filled. Should the weather prove dry at the time they are finished, it is well to cover their surfaces with straw, or litter, to hinder them from “cracking.” And “as it is desirable to get them filled as soon as possible after they

\* Marshall's Rural Economy of Yorkshire.

† Corrected Report of the North Riding of Yorkshire. ‡ Ibid.



are finished, snow is frequently collected and heaped upon them, if possible, in large quantities, the first winter after they are finished, for that purpose\*.”

The form of ponds for this use is in general that of a shallow basin, the sides shelving in a gradual manner from the brim to the centre. But other forms may be adopted according to circumstances. In the first mode, where the excavation is sixty feet in diameter, the greatest depth is about seven; but when only forty feet in diameter, the depth is mostly about five, before any of the coats are applied†. There would seem, however, to be an advantage in having such ponds of greater depths and less diameters, as it is well ascertained that the quickness of evaporation is in a great measure in proportion to the extent of surface that is exposed to the influence of the atmosphere: of course such ponds as have great diameters with little depths, must become dry in hot seasons much more quickly than where the contrary is the case.

In setting out ponds of this sort, the use of the *level* will be necessary; stakes being driven down as a guide to work by in forming the banks, and in making the conducting channels and waste-water pools. The materials raised from the excavations must be taken away or applied according to the circumstances and situations of the land; but wherever the sorts of loose materials are employed, great care should be taken to have them well wrought together, in order to give them due solidity.

The expense of forming ponds of this kind must vary greatly according to the situation, the nature of the soil, and various other causes. They are “usually made by men who go about for the purpose, and are chiefly, or entirely, engaged in it, and who usually contract for the job. One of the diameter of sixty feet and depth of six feet may in most situations be executed for about 15l.;” and “one of forty-five feet by five feet, for 10 or 12l.; but some allowance must be made for the different prices of lime, and the distance it may be necessary to convey it, as well as the clay, or the other materials for the work. A pond of sixty feet diameter by six feet deep, will contain upwards of 700 hogheads of water; one of forty-five feet by five feet, near 400 hogheads—a vast supply, when obtained at so small an expense.”

Mr. Marshall in his *Rural Economy of Yorkshire*, where the subject is fully considered, has calculated the expense of each square yard of coated surface to cost from sixpence to sevenpence halfpenny; which at present would probably cost ninepence or tenpence‡.

\* Corrected Report of the North Riding of Yorkshire.

† Ibid.

‡ It is remarked in the *Agricultural Survey of the North Riding of Yorkshire*, that the improved practice of constructing ponds of this sort is capable of succeeding in almost any situation in any district.



In speaking of farms on the Mendip hills, Mr. Billingsley, in the Agricultural Report of Somersetshire, mentions a method of constructing drinking-pools for

The following, which is chiefly drawn from Mr. Marshall's Rural Economy of Yorkshire, is the method recommended for executing the business.

“ Let a circle be marked on the ground sixty feet in diameter, more or less as the person chooses, or the size of the pasture may require a supply of water; and if of that diameter, let it be hollowed out in the shape of a basin, or bowl, to the depth of seven feet in the centre. When the surface of this hollow has been raked smooth, let it be well beaten over so as to reduce it into as even, uniform, and firm a surface as the nature of the ground will admit of; on this, well fallen, screened lime must be uniformly spread with a riddle, to the thickness of two or three inches; the more porous or open the ground, the greater will be the quantity of lime required: this lime must then be slightly watered, to make it adhere firmly to its place, and great care must be taken to spread it equally, so that no place remains uncovered, as on the lime depends, more than any thing else, the success of the work. On this lime must be laid a bed of clay, to the thickness of about six inches, which, being moistened sufficiently to render it ductile, is to be beaten with mallets, or beetles, into a solid compact body, capable of being trod upon without impression or injury. Great care is to be taken in laying on uniformly this mass of clay, and beating it into a compact body; for which purpose not more must be spread at a time upon the lime than can undergo the beating while it retains a proper temper or consistence for the purpose: after the whole is thus finished, it is gone over several times by the beaters, and sprinkled each time with water, and care is taken to prevent any cracks being formed, which might entirely destroy the power of retention.]

“ Pure brick-clay is not required; but any tenacious earth, that by beating will become of a solid compact body, will answer the purpose. As soon as this operation has been duly performed, the whole surface of the clay is covered, to about the thickness of a foot, with broken chalk, fine gravel, or the chippings of mouldering stone, or limestone, to prevent any injury being done by the treading of the cattle. It is necessary to observe, that coarse stones, or any stones of a texture that will not unite into a solid body, must not be made use of, as such are liable to be displaced by the treading of the cattle, to be pressed into or through the bed of clay, or to be rolled down to the bottom of the pond; under all which circumstances the beds of clay and lime are liable to be broken, and the water consequently let out of the pond. Sometimes the clay is covered with fods, the grass side being laid downwards, as a support to the gravel, by which some saving of covering may be made; or several inches thick of common earth is laid upon them, or upon the clay without the fods, by way of bed for the covering, where gravel or such like materials may be scarce; by which something may be also saved.

“ After the clay has been well beaten, some workmen water the surface of it, and fold sheep or pigs for a considerable time upon it; the treading of which is found to be serviceable in rendering it more compact.

“ Some people, instead of using slaked lime, have good mortar made of lime and sand well worked together, and cover the surface of the ground with it to the thickness of about an inch: this, if carefully done, is thought by many to be the most effectual mode of rendering the bottom retentive; but the mortar is liable to crack before the clay gets bedded over it: which must be carefully guarded against. Ponds have been made where a coat of mortar has also been spread over the surface of the clay as well as under it—an approach, perhaps, as near as possible to perfection—but where lime bears a high price, the expense is thus considerably augmented.



cattle by means of mason's work, as on such elevated regions springs are seldom to be met with. Such skill is displayed in the forming of them that they scarcely ever let the water through or prove leaky\*.

In cattle drinking-ponds it is a circumstance of great importance to the health of the animals to have the water as pure and free from impregnations as possible; but it is extremely difficult to provide it in such a state except where the water is in constant motion: something might probably, however, be done, especially where waste-water pools are provided, in rendering the water more pure, by having it, in its passage to the large reservoirs, percolating through a sufficient body of coarse sandy or gravelly materials so confined as to prevent their being carried away.

*Cow-keeping.*—This is a practice from which much profit and advantage may be derived in particular situations and circumstances, as where the land lies near large towns, and is highly fertile and productive in good herbage; and where in addition to this the farmer has the means of conveniently providing various other sorts of food, either of the succulent green or other kinds. But to undertake this sort of management under the contrary circumstances could only terminate in loss and disappointment.

"Experience, now of many years, and the universal use of these ponds in this country, wherever wanted, have proved them when carefully made, so effectually to retain water; to preserve it of so good a quality, when not fouled by the treading of cattle; and to be applicable to so many situations, that they cannot be too strongly recommended in all high situations, where water may be much wanted, or in all other situations where the water may be of a bad quality: they are equally applicable to our dry wolds, downs, and heaths, which are without water, as to every fenny tract which has too much of it, but of a brackish or unwholesome quality."

\* It is stated that supposing the dimensions to be forty feet in length, sixteen in width, and six feet in depth in the middle, the expense may stand thus:

|                                        | £. | s. | d. |
|----------------------------------------|----|----|----|
| "Digging out the foundation*           | 2  | 2  | 0  |
| Mason's labour                         | 10 | 10 | 0  |
| Three hundred bushels of lime          | 3  | 0  | 0  |
| Ten loads of clay and carriage         | 1  | 0  | 0  |
| Eight loads of coal-ashes and carriage | 1  | 8  | 0  |
|                                        | 18 | 0  | 0  |

"Some persons, who are cautious, go to a considerable distance for lime made from the *white lyas* stone, which is certainly a stronger cement under water than the lime burnt on these hills. In this case an additional expense is incurred.

"A pool of these dimensions, if properly situated, will supply eighty or one hundred acres with a sufficiency of water for the stock throughout the year, and, if well made, may be kept in repair for sixpence a year."

\* In most cases this will furnish a sufficient quantity of stone for the building.



But, besides these, there are other circumstances to be regarded in the conducting the business of a milk-dealer, such as those of providing cows that afford the largest possible quantity of milk in proportion to the food they consume. This is a point that does not seem to have been much subjected to experiment, though the profits of the farmer must in a great measure depend upon it, as where such cows are employed as do not answer in this view, a daily loss must be sustained. As this sort of farming is in most cases, as has been observed, only capable of being carried on with advantage in situations where the food is of the most rich and suitable kind, and capable of being provided in sufficient proportion to feed the animals in a plentiful manner, it would appear not improbable but that the large breeds may in general be the most proper for the purpose. But when attempted in other circumstances, where the food is neither so good in quality nor able to be provided in such abundance, breeds of a smaller description may be preferable, as it never can answer the farmer's purpose in this, or probably any other view, to have the cattle disproportioned to the nature and quantity of his keep. The inclination or tendency to feed in animals for this use is likewise a circumstance to be attended to by the cow-farmer, as where it is discovered to prevail they should be rejected as improper; it being found from experience that such cows as possess this property seldom or ever afford much milk. The disposition of cows has also some influence in respect to the quantity of milk which they may afford, as such as are mild and gentle in general milk much better than where the contrary is the case.

The sort of cow most adapted to the intentions of the milk-farmer must of course vary, according to the nature of his situation and the means which he possesses of providing food. Under the first circumstances, the large short-horned, or Holderneffe breed, may commonly be the most advantageous; but in the latter, the long-horned, the Suffolk, Polled, and the Alderney breeds may be more profitable. There are likewise other breeds of the smaller kinds that may be found beneficial in these cases\*. It has, however, been suggested as not improbable, but that though the large breed just mentioned may at first, while there is a full supply of green or other juicy food, afford a very large quantity of milk, the smaller sorts continue to give a more regular quantity for a greater length of time †.

Whatever the breed of cows may be that is employed by the milk-farmer, he should constantly choose such as are wide in the horn, thin in the head and neck, dewlap not too pendulous, the carcase deep and flattish, wide (rather pointed) hips, buttocks round and fleshy, legs thin, with short joints, the udder capacious, not

\* See Dairying.

† Anderson's Recreations in Agriculture.



fleshy, but extending well backwards, the milk-veins large and prominent, and the teats long and large. A tame and gentle disposition is also, as has been shown, a circumstance of importance. The beauty of form is therefore never to be attended to in providing cows for the supply of the milk-dealer. It is chiefly the quantity of milk that is to be regarded; of course, all such cows as do not afford a *full* supply should be disposed of as soon as possible, as being very unprofitable in this sort of management.

Cows mostly come into milk about the third year of their age, and are in full milk at the fifth, and they may be continued to the eighth or tenth, according to circumstances. But in the practice of cow-keeping, from the high manner in which the animals are kept, it is necessary to change them much more frequently. With respect to the exact length of time that they may be continued as milkers with the most advantage, it does not seem to be well ascertained by experiment; but it is probable that it cannot be more than two, three, or four years at the most, though much must undoubtedly depend upon the constitution of the animal. It is the best, however, not to keep them too long, as the vigour of secretion is much less in old than young animals; and besides, they become more liable to swellings and indurations in the udders, as well as other diseases\*.

The age of cows is readily known by their shedding the tips of their horns at three years old, and the first rings commencing at the bottoms of them at four†.

The cow-keepers in the county of Middlesex almost wholly employ the large Holderneffe breed, which are brought from a district thus denominated in Yorkshire, as well as others in the same neighbourhood, where the most perfect of this kind of cows are met with‡. It is observed that the dealers in this sort of cattle buy them of the breeders when they are three or four years old, and in calf, exposing them to sale afterwards at the fairs and markets in the county, particularly near the metropolis, where there is a fresh supply from the country weekly, by means of which the cow-keepers are enabled to keep up their several stocks. Great numbers of cows are likewise bought in the above places in lots of ten or twenty, by private commission, and forwarded to the respective cow-keepers in the above neighbourhood. The prices were formerly from ten to fifteen guineas, but for the last two or three years have increased to sixteen or eighteen, and are now advanced to twenty or more. The cow-keepers breed very few cattle, and those only from cows that

\* Annals of Agriculture, Vol. XVI.

† Ibid. Vol. XXXII.

‡ Corrected Report of Middlesex.



give much milk, and with very little attention to the choice of the bull. When keep is plentiful, the best season for purchasing these animals, in respect to price, is the autumn, or the beginning of winter\*.

The length of time which cows go with calf is nine months. It is the practice with some to keep an account of the periods of their taking the bull; and where the stock is extensive this is of much advantage, as it not only enables the farmer to calculate with more certainty on his supply of milk, but to have proper attention paid to them before as well as at the time of their calving; which is of much benefit to the animals.

There is a difference of opinion in regard to the distance of time they should become dry before their calving, some contending, that they may be milked almost to the time of their dropping the calf without injury; while others maintain, that it is absolutely necessary that cows should be laid dry from one to two months, both for the advantage of themselves and their calves. It is probable that much in this business must depend on the manner in which they are kept; as where they are well fed they may be continued in milk till within a week or two of their calving, without suffering any injury whatever from it; but in the contrary circumstances it may be better to let them run dry for a month, six weeks, or more, according to their condition, in order to their more fully recruiting their strength. It appears, however, not improbable, but that the longer the milking is continued, the more free the cows will be from indurations and other affections of the udder; which is a circumstance deserving of attention. Where only one or two cows are kept for the supply of a family, it is likewise useful to know, that by good feeding they may be continued in milk without any bad consequences till nearly the time of calving. We have tried this method several times, without perceiving the least possible injury to arise from it. And in the Agricultural Survey of the West Riding of Yorkshire it is stated, that no advantage was found on trial to result from allowing the cows "to go dry two months before calving." They have there been kept in milk till within ten days of the time of dropping the calf.

Where cows are kept in any great number, it is always an advantageous practice to keep bulls along with them, as by such means they not only take them more readily, but are prevented from its being omitted through inattention; which is otherwise often the case. Besides, the great trouble, inconvenience, and loss of time in driving them to a distance, is avoided. From twenty to five-and-twenty

\* Corrected Report of Middlesex.



or thirty cows are sufficient for one bull. They show their inclination for taking the male by riding upon the other cows.

After three or four months, cows may be ascertained to be in calf by pressing upon the off flank with the hand, as where that is the case the calf is found to strike against it.

They are shown to be near calving by their springing at the udder and the bearing; the former becoming more fully distended with fluid, while the latter is larger and more swelled out. Heifers, or young cows, are said to spring the soonest at the bearing, and those of the older kinds at the udder.

From accidents and other causes, it sometimes happens that cows *slip* or *slink* their calves before they are sufficiently grown. Where this occurs, it is essentially necessary to remove such cows immediately from the cow-yards, or from mixing with the other cattle, for a few days. But where cows are much subject to such accidents it is the best method to get quit of them as soon as possible, as they will seldom turn out profitable.

In two, three, or four days, according to circumstances, after the cows have calved, it is the practice of the London cow-keepers to send the new-dropped calves to be sold, as they would not be saleable before. The cows are thus left in full milk from within a few days of the time of their calving. But in other situations that cannot always be the case, as the demand for suckling-calves is less; they must therefore be often suckled by the cow-keepers.

Where it is not the practice to bind up the cows in houses for the purpose, especially during the winter season, which seems by much the best method, warm well sheltered yards, with open sheds, should be provided, in order to protect the animals, and prevent their being exposed to the weather, as by such means they will afford much larger supplies of milk than where they are left in a state of exposure to wet and cold in open dirty yards, as is often the case. The bottoms of yards for this use should be well laid with some sort of hard materials, and the dung be frequently scraped off them, so as to keep them as dry and clean as possible. They should also have plenty of good clean water to drink of at pleasure. If due attention be not bestowed in these respects, which is seldom done, it is impossible that the advantages that might otherwise be the case can be derived from them.

In the feeding of the animals it has been observed, that care should be taken to keep them constantly in good condition, as where they are ever suffered to become very lean, and that in the winter season, it is impossible to suppose that they can be brought to afford a large quantity of milk, by getting them into perfect



condition in the summer months ; as where cows are lean at the period of calving, no management afterwards is ever capable of bringing them to afford for that season any thing near the proportion of milk that they would have done if they had been supported in proper condition during the winter\*. Food of the most nourishing and succulent kinds should therefore be regularly given in suitable proportions in the cold inclement months, and the animals be kept warm, and well supplied with pure water, in the way just mentioned†. Some advise their being cleaned by combing and other means ; but this is a practice, which though useful in making them yield their milk more freely‡, can perhaps seldom be employed on an extensive scale.

In this sort of business the cow-keepers find great advantage in keeping the animals constantly fed with different kinds of succulent food, such as brewer's grains in a fresh unfermented state, turnips, cabbages, green tares, fresh cut grass, and soft green rye, or hay that has undergone little or no fermentation in the stack :—By this means much juicy matter is thrown into the system, and a continual varied stimulus kept up, by which a large increase of milk is produced. As the different articles thus employed must have less effect in exciting the secretory organs of the animals in proportion to the frequency of their use, the utility of varying their food as much as possible is rendered sufficiently obvious. On the same principle there are probably various other substances, as well as these, that might be made use of with great benefit ; but too few experiments have yet been made with them, in this view, to lead to any useful conclusions. There is another circumstance, however, that deserves the attention of the milk-farmer, in the feeding of his cattle, which is that of the dry food being properly proportioned to that of the green or rich succulent kind, as, where this is not well attended to, the cows, by being kept in too lax a state of their bowels, from the great tendency which such materials have to run off in that way, may afford a much less quantity of milk than would otherwise be the case. We know from repeated experiment that considerable loss sometimes takes place in this manner. In the foddering of the cows, regard should also be had to supply them with the food in such a way as to excite the secretions in as regular a manner as possible. In this view too much food should never be given at one time, but supplied more frequently, as three or four times or oftener in the course of the day. This practice will likewise have an advantageous effect in having the fodder more cleanly eaten up.

\* Anderson's Recreations in Agriculture, &c. Vol. III.

† Ibid.

‡ Corrected Report of the West Riding of Yorkshire,



The method of giving cows their food by the milk-farmers in the vicinity of the metropolis, where this business is carried on upon the most extensive scale, is thus stated in the valuable Agricultural Survey of that district: "During the night the cows are confined in stalls; about three o'clock in the morning each has a half-bushel basket of grains; when the milking is finished, a bushel basket of turnips is given to each cow; and very soon afterwards they have an allotment, in the proportion of one truss to ten cows, of the most grassy and soft meadow hay, which had been the most early mown, and cured of the greenest colour. These several feedings are generally made before eight o'clock in the morning, at which time the cows are turned into the cow-yard. About twelve o'clock they are again confined to their stalls, and served with the same quantity as they had in the morning. When the afternoon milking, which continues till near three, is finished, the cows are again served with the same quantity of turnips, and about an hour afterwards with the same distribution of hay as before described. This mode of feeding generally continues during the turnip season, which is from the month of September to the month of May. During the other months of the year they are fed with grains, cabbages, tares, and the foregoing proportion of rouen, or second cut meadow hay, and are continued to be fed with the same regularity until they are turned out to grass, when they continue in the field all night; and even during this season they are frequently fed with grains;" which are kept sweet and eatable for a considerable length of time, in the following manner: This is by depositing them in vats, or pits, below the surface of the ground, treading them tightly down into them, and then covering them over with a layer of earth, so as to prevent the air from coming in contact with them, and thereby producing fermentation. In this way they may be continued in a perfectly sound state from the month of March till the summer, when the brewing is discontinued. They are also capable of being preserved when well trodden down into casks or tubs, which have perforations in the bottoms for the purpose of draining off the superabundant moisture: these should be raised to some height from the ground by pieces of timber. In country situations it will seldom be necessary to preserve them in this way, as they will chiefly be wanted in the winter season.

Near Leeds in Yorkshire, the milk-dealers in some instances feed their cows with cut grass in the summer season, and brewer's grains and oat straw in the winter. And in the vicinity of Sheffield the "most experienced cow-keepers give five hundred weight of linseed dust mixed with three hundred weight of bran per week to six cows; others give a quarter of a peck of beans, with a peck of grains for one feed



for one cow, three times a day\*." These are probably too expensive methods to be generally adopted; but as they are found to answer well, they may be employed with advantage in particular situations. It is remarked in the Agricultural Survey of Middlesex, that "some cow-keepers have tried salt mixed with the grains, more with a view to preserve the grains longer in a sound state, than from any consideration as to the health of their flock, or the improvement of the quality of the milk. It is acknowledged that the cows eat the grains so mixed with great avidity; but the proprietors not getting an adequate return for their trouble and expense, it is not found that it is now much practised." It has however been contended, that the mixing of common salt with the food of cows not only improves the quality but increases the quantity of the milk, and at the same time is serviceable to the health of the animals; but accurate experiments are wanting to fairly determine the question.

The observations of Baron D'Alton on the management of these animals, go to prove by various accurate calculations, that a greater profit is capable of being derived from the keeping of them in the house than in the usual method of allowing them to feed in the pastures. And the author of the Agricultural Survey of the West Riding of Yorkshire has remarked, that by keeping cows upon red clover and rye grass, tied up in the house in the day-time during the summer season, and putting them out after milking in the evening for the purpose of air and water, one acre of clover has been found to go as far as two when pastured; besides a larger quantity of milk afforded. The large portion of rich manure that is made in this way is supposed to compensate any additional trouble or expense that may be incurred in cutting and conveying the food to the yards. In this method of keeping cows, as well as those with grains and other sorts of succulent food, it is constantly necessary, for the reason that has been mentioned, to combine some sort of dry meat, such as hay, straw, or other similar materials, with the grasses. In soils where lucern can be grown to advantage, it may be made use of with more benefit than the above; and by combining other sorts of green juicy food with either of them, it seems not improbable but that a still greater profit may be produced. Of the superior advantage of keeping milch cows in this method there can be little doubt, when considered in different points of view.

In the milking of cows, more attention is probably necessary than has hitherto been bestowed upon the subject, in order to obtain the greatest possible quantity of milk. On the physiological principle of the secretions of animals

\* Corrected Agricultural Report of the West Riding of Yorkshire.



being increased in proportion as the secreted fluid is more frequently withdrawn, it has been recommended to have recourse to more frequent milkings in order to augment the quantity of that fluid in cows. And there can be little doubt but that by accustoming the secretory organs to a more frequent secretion, such a habit may be established in them as will afford a larger proportion of milk in a given time. But in order to effect this in the most perfect manner, it will be necessary to have the cows highly fed, and to observe the greatest regularity and exactness in the periods of milking, and to be careful that every drop of milk is drawn away each time, as without due regard in these respects the desired effect will not be produced. This is fully shown to be the case by the few experiments that have been instituted with the view of deciding the matter; as while the cows were consuming the more juicy spring food, there appears to have been an increase in the quantity of milk both by three and four milkings in the day; but in the autumn season there seems to have been rather a decrease under the same circumstances\*.

Such trials, to afford any satisfactory conclusions, should have been continued for a much greater length of time, being varied considerably in the times of milking, and nicely compared with the nature and quantity of the food employed; as it is only by ascertaining how much depends upon the simple operation of taking away the milk, and how much upon the quality and proportion of food that is taken in, that the question can be fairly decided. It is not to be supposed that merely

\* In order to ascertain the advantages to be obtained in this way, the following experiments were made by Mr. Macro, and are stated in the twelfth volume of the Annals of Agriculture:

| 1789.                      | Pints.                 | 1789.                          | Pints.          |
|----------------------------|------------------------|--------------------------------|-----------------|
| May 21, First meal - - - - | 9 $\frac{1}{2}$        | October 22, First meal - - - - | 11              |
| Second do. - - - -         | 13                     | Second do. - - - -             | 6               |
|                            | <hr/> 22 $\frac{1}{2}$ |                                | <hr/> 17        |
| 22, First meal - - - -     | 13                     | 23, First meal - - - -         | 11              |
| Second do. - - - -         | 8                      | Second do. - - - -             | 3               |
| Third do. - - - -          | 5                      | Third do. - - - -              | 3               |
|                            | <hr/> 26               |                                | <hr/> 17        |
| 23, First meal - - - -     | 12                     | 24, First meal - - - -         | 10              |
| Second do. - - - -         | 7                      | Second do. - - - -             | 1 $\frac{1}{2}$ |
| Third do. - - - -          | 6                      | Third do. - - - -              | 1 $\frac{1}{2}$ |
| Fourth do. - - - -         | 1                      | Fourth do. - - - -             | 3               |
|                            | <hr/> 26               |                                | <hr/> 16        |



increasing the number of milkings for a few days can have much influence in altering the state of secretion in the animals.

Some in the intention of increasing the quantity of milk have recommended milking, when the cows are fully fed in the summer season, three times in the course of the day at equal distances, as the convenience of the business will admit, as the most proper:—Early in the morning, about the middle of the day, and in the evening before it is too late. The exact proportion of increase in the milk that may be produced in this way over that of milking in the morning and evening only, which is the usual mode, has not, that we know of, been ascertained with any degree of accuracy; but some suppose that it may approach to nearly one-half of the whole, while others contend that it cannot be any thing near so much\*. If a third were gained, by such means, it would amply repay the cow-keeper for his additional trouble and expense.

The method of milking adopted by the cow-farmers in most cases, is only to have their milking performed twice in the course of twenty-four hours. In such cases the most proper times would seem to be about seven o'clock in the morning and five in the afternoon; but in the neighbourhood of London and other large towns it is the practice to have this work performed from four to half past six in the morning, and from half past one to three in the afternoon†. It is, therefore, probable that more frequent milking in the business of cow-farming, especially when conducted upon any extensive scale, would not only be inconvenient but impracticable. In such cases all that can be done is, perhaps, that of having the operation executed with as much care as possible, in respect to the whole of the milk being taken away each time, and by persons who are careful and perfectly accustomed to the work. Where this is neglected, much loss may be sustained not only in the immediate produce of the milk, but in the cows becoming much more quickly dry, as well as their being more subject to affections of the udder. The best advice is to have the business performed in an expeditious manner, in regard to the whole of the animals, and with the utmost attention in respect to cleanness. A sufficient number of persons should of course be employed in proportion to that of the cows. An expert milker is capable of performing the operation on from six to seven or eight cows in the course of an hour‡.

The profit or advantage of this method of farming must vary considerably, in pro-

\* Anderson's Recreations, &c. Vol. III. † Corrected Agricultural Report of Middlesex.

‡ Annals of Agriculture, Vol. XXXII.



bortion to the situation, in respect to the convenience of sale of the milk, and the facility of providing the animals with suitable kinds of food\*. It is a method that requires fewer servants or attendants than most others in proportion to the

\* It is observed in the Agricultural Survey of Middlesex, that the quantity given by each cow, on an average, is nine quarts a day, equal to, per annum, 3285 quarts. The calf takes part of the milk for the first two or three days, during which time it would not be saleable; and there is a falling off for a few days before the cow calves: these occasion a deduction of about eighty-five quarts, leaving the annual saleable produce of each cow about 3200 quarts, which at the medium price of seventeen-pence for eight quarts stand thus.

## Dr.—Expenses of one Cow.

|                                        |       |
|----------------------------------------|-------|
| To turnips, 14 bushels per week, s. d. |       |
| at 2½d. per bushel - - - - -           | 2 11  |
| Grains, 7 ditto, at 2½d. per ditto     | 1 7½  |
| Hay, 1 truss and 4-tenths, at 1s. 9d.  |       |
| per truss - - - - -                    | 2 5½  |
| Et ceteras - - - - -                   | ½     |
|                                        | <hr/> |
|                                        | 7 0   |

7s. per week, or per year £. 18 4 0

Balance - - - - - 11 6 0

---

29 10 0

## Cr.—Produce of one Cow.

By milk on an aver. 9 qts. per day, or 3285 quarts per year

Deducting - - - - - 85

quarts for loss before and after calving,

---

3200

At 17d. for 8 quarts £. 28 6 8

By a calf at two or three

days old, average 1 3 4

---

29 10 0

leaving a balance of eleven pounds six shillings for interest of stock, losses in cattle, the hire or support of horses and waggons, rent of buildings, attendance and profit.

It is remarked that "the consumers pay three-pence halfpenny per quart to the retailers. If the latter were to sell the milk pure and unadulterated at this price, it would yield them a profit of 64l. 14s. per cent. But, in order to discover the actual profit of the retailers, we must add sixpence for short measure and the extraneous articles mixed with it, which increases 2s. 4d., the usual price of eight quarts, to 2s. 10d.; and, as it costs them only 1s. 5d., there remains for labour and profit 100 per cent.: thus the retailer clears 28l. 6s. 8d. by every cow.

Near Liverpool, Mr. Harper found the average produce of cows, under an industrious manager, to be nine quarts of milk per day the year through; which is sold at 2d. per quart with the advantage of selling cream, but which, from other milk being brought from the country, is reduced in milk and cream to 2d. per quart. The keep and produce therefore stand thus:—

## Dr.—Expenses of one Cow for a Year.

|                                         | £.    | s. | d. |
|-----------------------------------------|-------|----|----|
| To average keep of a cow in grains, &c. |       |    |    |
| for one year, at 4s. 6d. per week -     | 11    | 14 | 0  |
| To 160 stone of hay, at 8d. per stone   | 5     | 6  | 8  |
| To grass 16 weeks, at 3s. 6d. per week  | 2     | 16 | 0  |
| Balance - - - - -                       | 7     | 10 | 10 |
|                                         | <hr/> |    |    |
|                                         | 27    | 7  | 6  |

## Cr.—Produce of one Cow for a Year.

|                                   | £.    | s. | d. |
|-----------------------------------|-------|----|----|
| By milk on an average of 9 quarts |       |    |    |
| per day—3285 quarts, at 2d. per   |       |    |    |
| quart - - - - -                   | 27    | 7  | 6  |
|                                   | <hr/> |    |    |
|                                   | 27    | 7  | 6  |



extent of business; seldom more than four or five men being employed in the attendance of three hundred cows. The expense of milking is thrown upon the milk-dealer, who contracts for the produce of a certain number of cows. If this was not the case, the expense to the cow-keeper would be very high, as one woman cannot milk more than eight or nine cows twice in the day. In country situations this may, however, not always be the case. The cow-houses in Middlesex are mostly provided with milk-rooms, where the milk is measured and served out by the cow-farmer\*. It has been observed, "that of the several different ways of raising a profit from milch cows, that of selling the milk, where circumstances will allow of its being carried on to a due extent, is by far the most eligible. In the economy of making butter and cheese, the trouble and expense are daily and perpetual. Several extraordinary domestics must be employed where the dairy is large; and no small allowance of fuel is necessary, that boiling water may be still at hand, to scald the pails and other utensils employed on the occasion. In suckling, also, the charges are much heavier than when the milk is sold out of the pail; for sucklers are continually wanted, which are often bought in at very advanced prices, and sometimes these are not to be procured at any rate just when they may be required; so that either the calves which are ready for the butcher must be kept a week or two longer than would otherwise have been necessary, (in which the farmer will rarely find his account), or, if these calves are sold off, there will be an overplus of milk, of which it will be found difficult to make any profit, since it will not produce a quantity of cream sufficient to make any advantage by the butter. Now the milkman has none of these inconveniences to struggle with; and, whilst the cows continue to yield an ample produce, and this goes off at a quick sale, the whole of the business is performed with little trouble; and, what is an additional advantage, each cow yields a profit before her milk is sent to market by the sale of the young calf; whereas the suckling-farmer, as was mentioned before, is often under the necessity of purchasing such young calves to keep up his flock,—a balance greatly in favour of those persons who make sale of their milk†."

*Suckling of Calves.*—This is another method in which the produce of the cow may in particular situations be turned to great advantage. It is only, however,

In the neighbourhood of Leeds, in Yorkshire, independent of straw or other dry food, they find to maintain a cow for the winter months requires about four pounds worth of brewer's grains, and two pounds worth of grass for the summer months; so that the annual expense in these kinds of food is six pounds, and the produce of their cows about six to eight quarts of milk per day. In other parts the expense of keeping is seven pounds per annum, and the produce yields about ten pounds.

\* Middlesex Report.

† Synopsis of Husbandry.



in the neighbourhood, or within a certain distance, as twenty or thirty miles, of large towns, where the demand for veal is constantly great, that the practice can be attempted with success. In other circumstances it is by no means applicable, or to be depended upon by the farmer. Where the pastures are rich, and situated near the suckling-houses, it may be more advantageous than in other cases\*. In this business, as well as that of cow-keeping, the animals should be well suited to the nature and supply of food that can be constantly commanded. And as in the fattening of calves much depends both on the quality and quantity of the milk, those cows should be chosen for the purpose which, while they afford such milk as possesses rich and highly nutritious properties, may supply it in a tolerably large proportion. On these accounts the large Holderneffe breed of cows may often be less proper for the calf-suckling farmer than those of other breeds that do not afford milk in quite so large a proportion, but of superior quality. Where the pasturage, however, is good, and the command of other sorts of food easy at all seasons of the year, the larger breeds may be employed in this way with great profit. It has been advised by some, as the best method of obtaining a suitable breed of cows for the suckling business, to wean every year a proper number of calves from the best cows, which from their being raised where they are to be afterwards kept, and at a cheap rate, must be more advantageous than purchasing them from distant districts†.

But whatever the breed of cows may be that are kept for this use, they should be constantly well fed either by grazing in the pastures or by being foddered in the stalls. It is mostly the practice to feed them in the autumn, the winter, and spring months, while tied up, with brewer's grains, turnips, cabbages, carrots, and various sorts of green food that are made use of for soiling cattle; to which a suitable proportion of well made green rowen or meadow hay is added; and a full supply of pure water twice a day at least.

It is essential in this practice, that the suckling-house be spacious and airy, having a range of ties or fastenings on one side for the purpose of confining the cows, and on the other a set of cribs or pens for containing the calves. These should be so contrived, as, while they keep the calves as dry and clean as possible, they exclude them from the influence of the light. Some advise, in the first view, raised moveable floors formed of narrow laths or spars, nailed upon joists, at the distance of about an inch from each other, as by this means the moisture and nastiness are not only immediately drained off, but a considerable degree of venti-

\* Synopsis of Husbandry.

† Ibid.



lation effected\*. This method is probably, however, more necessary for calves in the state of rearing than those that are fattening for the butcher. In these cases it is mostly the custom to have only common floors. The pens or divisions should never be too large; as in this business the more quiet, and the less the calves move about, the better they fatten. And it is of the utmost consequence to have them kept perfectly clean, and free from every sort of disagreeable smell, as without attention in this respect the business never goes on well. This is best effected by frequent sweeping and cleaning them out, and having recourse to fresh clean wheat straw for littering them with every day. It is also a good practice to have collars made of leather to pass round the necks of the calves and buckle, as by this means they may be conveniently tied in the pens when necessary, and likewise be confined in their proper places while suckling, by fastening the lines that are fixed in the ceilings of the houses, for the purpose, to them. These contrivances not only save much labour, but prevent that confusion which would otherwise be the case. In this management one person is sufficient to the taking care of fifteen or twenty cows†. Some, however, think it better not to tie them in the pens‡.

There are two methods pursued in the fattening of calves; one is by allowing them to suck the cows, and the other to give them the milk after it has been drawn from the animals. The first is obviously the most adviseable practice, and that which is the most commonly followed. In this mode the calves are in general only admitted to suck twice in the day; but it would probably be more advantageous to let it be done three times, at as equal distances as possible from each other, as in this way the calves would be less liable to have their stomachs overloaded, and of course be less exposed to danger from scouring; and consequently fatten faster. In the latter method the milk is given them warm from the cow in the morning and evening, being gradually increased as the calves increase in strength and size. This practice is more troublesome, and has only the advantage of keeping the cows more quiet.

The length of time which is necessary for perfecting the business of fattening must vary according to circumstances; but in most cases it is from six, or seven, to eight or nine weeks. Where this is not a regular business, the fattening is however generally dispatched in a much shorter time.

It has been suggested, that “as it is necessary that the calves should always lie quiet, in order that they may indulge in sleep at those times when they are not employed in sucking, the cow-house should be situated in the most retired part

\* Section on Farm Buildings. † Annals of Agriculture, Vol. XXXII. ‡ Synopsis of Husbandry.



of the yard, and the pens should be kept as dark as possible. But notwithstanding this caution, the calves should by no means be suffered to lie too hot in the summer time; which would be apt to induce a sickness amongst them. To admit, therefore, an occasional draught of fresh air, let a window be cut in each pen, with shutters adapted to the same, and let these windows be opened whenever the closeness of the atmosphere indicates it to be necessary. In the summer season they should rarely if ever be closely shut; and when it is required, the stream of air may be increased by opening the cow-house door at the opposite end of the building." And it is added, that "as the calves are brought forth they are to be taken into the pens, and suckled on their own dams, which at first will yield a far greater quantity of milk than is necessary for their offspring, so that another calf may be suckled thereon; or the cow may be milked, and the cream be reserved for butter, or applied to any other use that the owner may think proper. As the calf increases in size, it will require a larger quantity of milk: but whilst they are young, one good cow will yield a full supply for two calves; and when the whole produce is demanded for one calf, another new milch cow should be provided, and these two cows will abundantly supply three calves with milk till the oldest is fit for the butcher; after which, if necessary, a fresh suckler may be bought in, and the business be carried on progressively by keeping the house constantly supplied with calves, so that the whole milk may be sucked\*." As the business of calf-suckling and dairying can seldom or ever be carried on to advantage together, it is always the best method to provide sucklers whenever they are wanted.

In most situations, within the distances that have been specified, the suckling-farmers supply themselves with sucklers from the London markets, as being the most convenient places to apply for them, so as to be on a certainty, as these are "the general receptacles where the milk-men vend their calves; and which having been bred from the larger sorts of cows generally turn out to good account for the suckler; such large-boned calves, when fattened, arising to a weight much more considerable than the ordinary produce of the country dairy-men: and as to the superior quantity of milk required in fattening the larger breed of calves, this is amply recompensed by the great increase of weight."

As young calves when permitted to suck their fill are often seized with a looseness or scouring; in order to prevent this, for the first fortnight or three weeks it is necessary to stint them in their allowance; but at the same time due regard should be had that they do not pine or decrease in flesh for want of milk. After this age they should be allowed to suck as long as they choose, and every means ought to be made

\* Synopsis of Husbandry.



use of to increase their appetites, and render them more eager after their food. Chalk may be made use of for this purpose, as well as for correcting the superabundant acidity in the stomach, and lessening the tendency to scour. The idea of its giving to the flesh a delicate whiteness is probably not well founded. Salt sprinkled in the troughs likewise acts as a stimulus to the appetite: besides these, it is a common practice with some to give their calves balls composed of flour, pounded chalk, and milk, with the addition of a small quantity of common gin, and sometimes a little tincture of opium. Of these balls they give two, about the size of a walnut, once a day, or oftener, to each calf. Such balls, being very nutritious, in some degree supply the place of milk, and at the same time, from the great stimulus which they afford to the young animals, dispose them to sleep, and thereby increase their disposition to fatten: but where milk can be had in sufficient abundance, it is never worth while to have recourse to these aids. When the demands of the calves, however, are beyond the powers of the cows, these balls come seasonably to their relief. Occasional bleedings have also been advised, to prevent loathing the food and diseases from plethora\*. In order that the calves may be provided with sufficient store of milk, the pastures should be changed whenever the cows are found to be deficient in this particular; and in the winter time they should be well fed in the manner directed above.

In this system of management it is constantly necessary to be buying in calves at a week or ten days old, or as they can be procured. The prices vary, according to the goodness and the time of year at which they are bought. In general sucklers fetch the largest price in summer, when veal sells the cheapest; and the reason is, the smaller number to be met with at that time than in the spring. A good suckler can seldom be bought for less than 20s. and is often sold for 25s. or 30s. They are kept till they fetch from four or five to seven or eight pounds†. The business of suckling was formerly reckoned to turn out to good advantage, when each calf throughout its fattening brought a profit to the farmer of three shillings a week; but at present the profit on suckling is much greater.

The calves that are suckled by their own mothers are in general found "to fatten in a shorter time than those which are afterwards bought in to supply their places: the reason of which is, probably, their not having been removed from the place where they were first dropped, and having always continued to suck the milk most natural to them; which must be supposed more nutritious, and to agree better with them, than that of any other cow. Besides, from the cows having lately calved, the milk nourishes and fattens in a higher degree than when they become stale milched. Cow calves are observed to fatten more kindly than the male or bull calves; and

\* Farmer's Magazine, Vol. III.      † Synopsis of Husbandry.



these last are much more coarse grained, and their flesh less delicate in taste, than the former\*." In some districts, barley-meal, and linseed boiled into a kind of jelly, and such-like materials, are sometimes given to calves in the course of fattening; but the above methods are greatly superior, though they may be more expensive.

It is found by experience that the veal of calves when killed at six weeks or two months old is seldom of so good a colour, or does the flesh of such young calves taste so well, as where the animal is suffered to live a few weeks longer. "To attain both these ends of colour and flavour, it is supposed necessary that the calves should be maintained with plenty of milk, and regulated under such management as before directed, till they arrive to the age of eight or ten weeks, according to the season of the year, the more or less kindly state of the calf, the particular demand of the markets, or other circumstances. In the summer season it may be proper to dispose of them at an earlier period than in the winter; not only on account of their growing away with greater celerity in warm weather, but likewise because of the increased demand for small veal, which is then most saleable. During the last three or four weeks, blood should frequently be drawn from the calf, which, it is supposed, will be a likely means towards rendering the veal of a colour delicately white; a circumstance so much attended to by the butcher, that he will commonly depreciate such calves as from the appearance of their eyes are likely to die *black*, as they term it, though in other respects not to be despised†." It is probable, however, that the colour of the veal depends upon the breed, and is incapable of being altered in this way.

Mr. Marshall is decidedly of opinion "that to suckle calves in general after they are ten weeks old is bad management;" as from the whole of his accounts, "those of nine or ten have paid as much a week as those of twelve or thirteen; and although a calf of six weeks old may suck nearly as much milk as a calf of twelve weeks old, yet the first month or five weeks the quantity is considerably less, and this advantage of their infancy is doubly as valuable to nine as it is to twelve weeks." The advantage of this practice is very considerable when conducted upon a large scale. Near the metropolis the gross product of a cow in this way was, before the late advances in the price of butcher's meat, estimated to rise on the average to seven or eight pounds in those of the moderate kind, and in very good ones to nine pounds. The profit at present stands much higher.

*Rearing of Calves.*—This is a practice that every farmer who is desirous of having a good cow stock should be careful in attending to, by selecting the best cow calves from such cows as are the most quiet, give the richest milk, are the most

\* Synopsis of Husbandry.    † Ibid.



hardy, and most adapted to the comparative goodness of the farm,—and rearing them with every possible attention. There are different modes of conducting this business: but the most natural and convenient, as well as that which is most advantageous to the animals, is permitting them to suck for a sufficient length of time to get into perfect order before they are put to other food, as in this way they become much stronger, and more disposed to thrive, than where brought up from the first by the hand; and, besides, the trouble is infinitely less. The proper method would therefore seem to be, that of letting the calves be suckled twice or oftener a day for some length of time before they are weaned. But this is a practice that is not by any means general, different districts having particular methods, which they consider as the best.

In Yorkshire the usual method is, for the first two or three weeks, for them to get milk warm from the cow; but for the next two or three weeks half the new milk is withdrawn, and skimmed milk substituted in its stead; and at the end of that period the new milk is wholly withdrawn; they are then fed on skimmed milk alone, or sometimes mixed with water, till they are able to support themselves by eating grass or other food of that sort. They are very seldom allowed to suck. But in Cheshire the practice is to allow the calves to suck for the first three weeks. They are then fed on warm green whey, or scalded whey and butter-milk mixed: with the green whey water is frequently mixed, and either oatmeal or wheat and bean flour added. A quart of meal or flour is thought sufficient to mix with forty or fifty quarts of liquid. Oatmeal gruel and butter-milk, with an addition of skimmed milk, are also used for the same purpose. Some one of these prepared kinds of food is given night and morning for a few weeks after the calves are put on that diet, but afterwards only once a day, till they are three months old or more. Calves in Gloucestershire are not allowed to suck above two or three days; they are then fed on skimmed milk, which is previously heated over the fire. When they arrive at such an age as to be able to eat a little, they are allowed split beans or oats and cut hay, and water is mixed with the milk. And the Suffex method is still materially different from any of these. It is common there to allow the calves either to suck for ten or twelve weeks, or to wean them at the end of three or four, and to give them a liberal allowance of skimmed milk for six or eight weeks longer. It is the custom in Suffolk to let the calves suck six or seven weeks, and then to give them coarse pollard and oats with skimmed milk and water, letting them have some nice green hay constantly till they are turned to grass. Carrots might likewise be used with advantage as a substitute for the oats. In



Norfolk, with early calves, the method is for them to suck twice a day for a fortnight, then to have the pail twice a day for an equal length of time, afterwards once a day for a month or six weeks longer; cut hay, turnips, and sometimes other materials being put in the racks and mangers. The latter is an excellent food where they take well to it, as they require but little water with them. With this combination of milk and turnips the calves are generally found to thrive extremely well.

In Scotland they have two methods for rearing calves: the first is by giving them a pailful, containing about a gallon, of milk warm from the teat of the cow, morning and evening, for eight or ten weeks; and the second is to allow the calf to suck its dam.

Where calves are reared with skim-milk, it should be boiled, and suffered to stand until it cools to the temperature of that given by the cow, or a trifling degree more warm, and in that state be given to the calf. Milk is frequently given to calves when made warm only; but that method will not succeed so well as boiling it. If the milk be given over cold, it is apt to cause the calf to *skit* or purge. When this is the case a little rennet may be put in the milk. If, on the contrary, the calf is bound, bacon or mutton broth is a very good and safe thing to put into the milk. From a gallon to a gallon and a half of milk per day will keep a calf well till it be thirteen weeks old. It may then be supported without milk, by giving it hay and a little wheat-bran once a day, with about a pint of oats. The oats will be found of great service as soon as the calf is capable of eating them. The bran and oats should be given about mid-day: the milk in equal portions, at eight o'clock in the morning and four in the afternoon. But whatever hours are chosen to be set apart for feeding the calf, it is best to adhere to the particular times, as regularity is of more consequence than is commonly supposed. If calves go but an hour or two beyond their usual time of feeding, they find themselves uneasy, and pine for food. It is always to be understood, that calves reared in this manner are to be enticed to eat hay as early as possible; and the best way of doing this is to give them the sweetest hay that can be procured, and but a little at a time. Turnips or potatoes are very good food as soon as they can eat them; and they are best cut small and mixed with the hay, oats, bran, and other similar substances.

There is another mode that may sometimes be adopted, which is that of sacrificing the milk for the benefit of the calves, by letting one or more run with the cows in full milk till they are capable of providing for themselves; but this is a method that has been objected to, as not letting the cows take the bull; which is probably a mistake. The more rapid growth of the calves, and the great convenience of the method, are however greatly in its favour.



When the calf is suffered to suck the mother, it should have the first of the milk, the rest being afterwards milked. It will thus have the thinnest part, which is the least liable to injure it by producing a scouring. As calves are frequently subject to be affected with looseness from a sort of indigestion being produced in their stomachs, which, when it proceeds to any great length, is termed the *skit*; great care should be taken, especially where they suck stale milked cows, or when taken from sucking and put upon other food, to guard against this effect; which may in most cases be accomplished by not letting them have too much at once, and gradually accustoming them to the change. When this effect rises to the state of disease, the best remedy is probably that of boiling pounded chalk, in the proportion of half a pound or more to four quarts of water, adding a couple of ounces of the shavings of hartshorn, with a quarter of an ounce of bruised cassia, for a few minutes, and then straining off the liquid, which may be given with the milk or other food, suitably warm, to the quantity of from half a pint to a pint, once or twice a day, according to circumstances. In these cases the calves should always be kept dry and warm under shelter from wet. If other materials be necessary to be mixed with the milk, wheaten flour will probably be found the best.

*Weaning of Calves.*—It is better in general to wean early than late, as calves that are weaned late in the season seldom rise to any great size. In January, or February, and till the beginning of March, may answer very well, but, except where the largeness of growth is of no consequence, it should not be attempted later: however, under such circumstances it may be continued till the early part of May. The best mode of doing this is to let the calves have new milk at the beginning, afterwards a mixture of new and skimmed milk, then simply skimmed milk, and ultimately a mixture of water and skimmed milk with a little barley or oat meal, or flour stirred into it. A small lock of sweet hay is also to be kept tied up within their reach, to induce them to eat that sort of food as soon as possible. The calves are soonest learned to drink their milk or other liquid food by the dairy-maid putting her finger in the pail that contains these substances while they are feeding. When they are once taught in this way to drink, no further trouble will be necessary.

It is not absolutely necessary to continue the giving of milk after the calves are a month or six weeks old; but they are certainly the better for it when it can be done.

From the increasing scarcity of milk, great attention has lately been bestowed in discovering substitutes that may answer the purpose without that valuable food, as by such means a greater number of calves might be reared; which would be of vast



importance to the farmer, as well as in other points of view. Various experiments have been instituted in this intention, but without any very complete success. It has been advised by Mr. Varlo to have recourse to a strong infusion of hay, made by pouring boiling water on good fresh hay, covering the vessel up closely during the operation, and letting it remain till the virtues are fully extracted; with the proportion of one pint of oatmeal, the same quantity of flax-feed, and a quart of skimmed milk; the flax-feed being bruised and put in with the hay, and the meal and milk added afterwards to the clear infusion\*. In this way, it is contended that a bushel of flax-feed, worth about three shillings, will be sufficient for rearing two calves. A similar method has been attended with success for young calves that have been kept with milk in Lincolnshire; but in this case the bruised flax-feed is boiled to a kind of jelly of light consistence, which, after being sufficiently diluted with warm water, is then rendered of the thickness of cream by barley meal being stirred in. When a great number of calves are to be reared, and the supply of milk is inadequate, by being used in combination with this composition it may be made to support nearly twice the number of calves†. The advantage that may be derived in this way has not however been fully ascertained by accurate experiments. A method recommended by the Duke of Northumberland was found to succeed well in his trials, and those of others since. It is by preparing skimmed milk with other ingredients, so as to answer the purpose where new milk is given, at about one-third the expense. The substances that are made use of are treacle and linseed-oil cake, reduced by the operation of grinding to the state of almost an impalpable powder; being employed in such slight proportions as, exclusive of the milk, to come to no more than about sixpence for thirty-two gallons. The manner of preparing it is this: "Take one gallon of skimmed milk, and to about a pint of it add half an ounce of common treacle, stirring it until it is well mixed; then to take one ounce of linseed-oil cake, finely pulverized, and with the hand let it fall gradually, in very small quantities, into the milk, stirring it, in the mean time, with a spoon or ladle, until it be thoroughly incorporated; then let the mixture be put into the other part of the milk, and the whole be made nearly as warm as new milk when it is first taken from the cow." In this state it is fit for use. "After a time the quantity of oil-cake powder may be increased." This should be done as occasion may require, and as the calves become inured to the flavour of such food.

Mr. Crook has been in the habit of weaning calves with success without any milk,

\* *New System of Husbandry*, Vol. III.

† *Annals of Agriculture*, Vol. XXIII.



by making a jelly of one quart of linseed boiled ten minutes in six quarts of water, which jelly is afterwards mixed with a small quantity of the best hay-tea.

It seems not improbable, from the trials which we have made, that potatoe-meal may be used this way with benefit, as it mixes well with either milk, water, or weak broth, and is highly nutritious. By this means the great expense of oats, meal, and other similar substances may be avoided. There are many other substances that might prove useful in this intention, if proper trials were made with them.

In regard to the period of castrating or gelding the calves, it is probably the best to perform the operation pretty soon after the calves have been dropped, as there will be less danger from bleeding, and of their taking on too much inflammation, at that period than afterwards, when they have attained a greater degree of health and vigour. Some advise three weeks or a month, but a week or a fortnight at most is perhaps much better. In the male calves, the cutter, when expert, after dividing the scrotum, or bag, and separating the testicles, draws out the spermatic vessels, by introducing his fore-finger and thumb. It is probable, however, that simple excision may be equally effectual, and must always be less hazardous. The *spaying* of the female calves, which is frequently performed, is an operation of greater nicety, and requires more dexterity in its management. Such calves as have been spayed are found from experience to be more quiet in the pastures, and afterwards to fatten more expeditiously.

Much care and attention is necessary, especially in the more early weaned calves, to keep them perfectly dry and warm, as their thriving will in a great measure depend upon this being effectually done. The substances, of whatever kind they may be, should be left off in as gradual a manner as possible, as the calves become incapable of supporting themselves on hay or grass. The following advice of a practical writer\* is judicious: After the calves have been weaned, especially the later ones, they should be turned abroad, in the day-time, into a small close or orchard near the farm yard, where there is a good bite of grass; and, as there is generally more than one calf weaned in a season, they will each be company for the other, and become in a short time reconciled to their situation. This pasture should be at some distance from that whereon the dams are turned, and have neither ponds or ditches, or any annoyance which may endanger the lives of these youthful animals; and in order to habituate them still more to their pasture, the food should be carried clean to them at each of their feeding-hours. For the first month or six weeks, they ought every night to be brought out of the meadow, and lodged in the pens; but,

\* Mr. Bannister.



after this time they may be left in the pasture as well in the night season as in the day: and their food may now be lowered by degrees, till it be at length reduced to simple water only; for, when the calves get to the age of twelve or fourteen weeks, they will no longer require the aid of this sustenance, but be able to satisfy their appetites by grass. Care, however, must be taken throughout the summer that they be frequently shifted from one pasture to another, in order that they may be kept up in good flesh, and enabled to grow away with the utmost celerity. At Michaelmas, or soon after, they should be taken into the yard; and if they were allowed the indulgence of a small close to themselves it would be still better. And here their taste must be gratified with the best and sweetest hay that can be procured, with an outlet on a dry pasture, where in fine open weather they may be suffered to enjoy themselves: it would redound greatly to their advantage, if, on the approach of winter, a shed was to be erected for them to repose in during the night, and for shelter in tempestuous days. So essential are warmth and good living to young animals of every denomination, that the care which has been taken of them in their early life will be manifest in every stage of their future growth. Nor is there any stock which will pay better for this cautious management in their youth than those of the cow kind; for if these are stinted in their feed, or carelessly attended whilst in their growing state, they will never arrive to that size which they would otherwise have done, and consequently the loss will be perpetually felt by the farmer who attempts to raise milch cows of his own breed without giving them a due attendance in the first year\*.

It is added by the same author, that “when calves have attained their first year they are called *buds* or *yearlings*; and though at this time they may be able to mix with the herd, yet it would be most prudent, if not attended with too great an inconvenience, to suffer them to remain in a pasture by themselves. But if this cannot be done, let them be turned out with the dry stock, and not permitted to run with the cows, as this might probably be the cause of their taking the bull—a measure which should at this age be cautiously guarded against, as such *buds* as propagate at this early age mostly receive a check in their growth on this account: and if, during the succeeding winter, they were to be managed as before directed, their future growth would be found to pay ample interest for the fodder that is now given them: only this is to be observed, that as their strength is now considerably augmented, a less valuable fodder may suffice, and good pea straw may supply the place of hay.

\* Synopsis of Husbandry.



Such farmers as have low rushy meadows, where there is frequently a length of old grass in the winter, may, in this second year, turn the calves into them, as they will meet with plenty of nourishing food, whilst the weather is fair and open."

At two years old some suffer heifers to take the bull, and think it the best method; but others suppose it a better practice for the cows, and more to the interest of the farmer, to wait a year longer before they are put to the males, as they will make much better cows by such a delay.

It is in all cases by much the best practice to feed the young cattle stock both the first and second year, especially in the winter season, as well as possible,—as, when the contrary method is adopted, their growth is so restricted that they can afterwards scarcely be brought into a proper state of thriving by the best food: such as turnips; hay, with root food, carrots, and potatoes, may be the most beneficial in the second winter, great care being taken to keep them clean by proper littering. When straw is the common food, such roots should be employed in a larger proportion. The two-year old cattle, whether of the male or female kind, should be fed with hay or good straw, according as they can be more conveniently afforded, interposing feeds of turnips, cabbages, or other similar sorts of food. In general it may be a good rule to keep cattle of the same age and kind as much together as circumstances will permit; as by such means they feed better, are less liable to accidents, and are capable of being fed more properly, as they mostly require the least feeding while young.

*Dairying.*—There are some sorts of grass lands that answer better in this management than others. It is not well decided, though general experience seems to favour the opinion, that the very fertile pasture lands may be more profitably applied to the purpose of grazing or fattening animals than that of dairying; but such as are not capable of bringing the larger sorts of cattle to a complete state of fatness, and which usually let from twenty to five-and-twenty shillings the acre, may be more profitably employed in this way. And most of the low and more moist kinds of meadow lands, which though the value may be high, as they do not succeed so well for the purpose of fattening, may be found highly useful for the dairy. The high, open, and exposed uplands are always less proper for this sort of practice than those which are situated lower, are more inclosed and warm.

In the management of the business, the nature of the pastures and other sorts of food which the farmer has at command, must direct him in the extent and kind of dairying which he is to pursue.

Where the grass lands are of the older kinds, and tolerably rich and fertile, butter should probably, in general, be the principal object; but where they have been



more recently converted to the state of sward, and are of a more cool as well as less rich quality, cheese may be the most depended upon. It is perhaps only under particular circumstances and situations that the different methods can be combined with profit and convenience. There are, however, cases in which this may be attempted with great advantage.

It has been an observation in dairying, founded upon long experience, that such lands as have been for a great length of time in the state of pasture afford milk that abounds more in the oily material, or cream; while those which have been a less time in that state, and are of a more cold nature, are more productive in such milk as has the caseous matter in a large proportion to that of the cream\*.

In Yorkshire the dairy-farmers are in many cases in the habit of preserving their old pastures in their original state, as they find the milk produced on them churns with more facility, and the butter is capable of being kept better than if such naturally rich grounds were highly improved. In some cases it has been found that there was great difficulty in making as well as preserving the butter, especially in the more warm months, where the land had been wholly ploughed up and improved by manure, particularly of the calcareous kind, where there was previously no difficulty of that sort, and the butter was of the best sort†.

Old pastures have therefore, besides the property of supplying the butyraceous material in greater abundance, that of rendering the butter more firm and waxy.

It has likewise been observed that the richness of the butter in the Highlands of Scotland has been universally attributed to the cows feeding upon the old grass in their remote glens; though it is suggested that this may partly depend on the management that is adopted in making it‡. In Cheshire they find that the inferior sorts of pasture lands are the best suited for cheese§.

But though this may in some degree be the case, there cannot be any doubt but that good butter may be made in many instances where the cows are kept in new pastures, and that excellent cheese may also be prepared where the lands that are employed as pastures have been long in the state of herbage. Butter equally rich and good with that made while the cows were grazed on the rich old pastures, has indeed been known to be sometimes prepared when they were fed with cut clover and dry grass in the stall§.

In commencing this sort of business, the farmer is therefore, as has been just ob-

\* Marshall's Midland Counties.

† Corrected Report of the West Riding of Yorkshire.

‡ Anderson in Bath Papers, Vol. V.

§ Young's Six Months Tour, Vol. III.

§ Ibid.



served, to determine, from the nature of his land, the situation and other circumstances, which sort of dairy management it may be the most proper and advantageous for him to adopt, whether that of the cheese or butter kind. It has not been shown by any set of experiments that can be fully depended upon, whether the butter or cheese dairy affords the largest profit to the farmer, when conducted under equally good management. The most valuable part of the milk is in each case converted into a substance of great utility; and though the former sells for a considerably higher price than the latter, from the differences in the quantity of the products, in the expense and trouble of management, and various other circumstances, it seems that the real advantages are nearly equal. It has been stated, before the late rise in the prices of these different articles, to amount, whether of butter and buttermilk, or of cheese and whey, to nearly fourpence-halfpenny for each gallon of milk\*; at present, perhaps, little less than from sixpence to sixpence-halfpenny.

In the vicinity of large towns, and wherever butter is constantly in great demand, it may however be more profitable to have a butter dairy instead of that of the cheese kind.

It is obvious that much of the profit in this sort of management must constantly depend upon the care and assiduity that is bestowed in conducting the different processes of the business. And it has been observed that this kind of management should only be undertaken by those who are capable of paying the most minute attention to every department of it; as, unless this becomes a fixed and established principle in the farmer's mind, the chance of success is precarious and uncertain. To trust wholly to common servants, in this sort of business, is always hazardous, and never to be practised where it is carried on to any extent.

The first thing that is necessary is that of being provided with a sufficiently large and convenient dairy-house, whether the object be cheese or butter. It should be so proportioned to the number of cows, as that there may be sufficient convenience for performing all the necessary operations without embarrassment; and much attention must be paid to cleanliness in every thing that relates to it, such as the shelves, floors, and different implements which are made use of, by daily scalding, scrubbing, rinsing, and drying, in order to prevent any sort of acidity taking place, as, without due regard in these respects, it is impossible that the produce can be of superior quality, or such as will keep sweet and good for any length of time, &c. Cleanliness may indeed be said not only to be necessary in dairy-husbandry, but to

\* Corrected Agricultural Report of Mid-Lothian.



be the foundation of it, and the most essential and least indispensable part of good management. It is observed that "a farmer may be in possession of the most valuable breed of cows, and these be fed on the richest pastures; but unless cleanliness prevail in the dairy, his butter or his cheese will never stand high in general estimation." Next to the size and situation of the dairy-house, and to keeping it and the utensils clean, is that of skill and attention in the general management. In short, without a knowledge of the best modes proper to be adopted under different circumstances, and a regularity, method, and prompt attention to their execution, it is obvious that the business must soon run into confusion, and become unprofitable.

The necessary apparatus, such as churns, milk-pails, cheese-cloths, trays or pans, brass milk-kettle and boiling copper, &c. exclusive of the cheese-press, for a dairy of twenty cows, will cost about fifty pounds. For fuel either coal or wood will answer, but faggots preserved in the stack one year are the best\*.

The next circumstance is that of providing cows of the most proper kinds, according to the method of dairying that may be practised. It has been found by long experience, that some kinds of cows give milk of a much thicker consistence and richer quality than others; and that this richness of quality is not necessarily connected with the smallness of the quantity yielded by those of nearly an equal size; it is therefore of consequence to the owner of a dairy to be peculiarly attentive to this circumstance. In choosing cows for the purpose of butter, it ought rather to be the quantity and the quality of the cream produced from the milk in a given time, than the quantity of the milk itself, that ought to be regarded:—this is a circumstance of more importance than is generally supposed; but where cheese is the object of the dairy, quantity of milk as well as goodness should probably be attended to. As there are cows in every district to be found, by a careful selection, that afford much thicker milk than others, these ought to be searched for with care, and their breed reared with attention, as being peculiarly valuable.

In comparing the milk of two cows in order to judge of their respective qualities, particular attention should be paid to the time that has elapsed since their calving; as the milk of the same cow is always thinner soon after calving than it is afterwards, as it gradually becomes thicker, though generally less in quantity, in proportion to the time the cow has calved. The colour of the milk, however, soon after calving is richer than it afterwards becomes; but this, especially for the first two weeks, is a faulty colour that ought not to be regarded†.



On the richer and more fertile pastures it is probable that the large and middle breeds of cows may be the most beneficial, especially where both cheese and butter are made; but in such as do not possess such a high degree of fertility, the middle and smaller breeds may prove more profitable to the dairy farmer. Some suppose the long-horned breed not well suited for the dairy; but experiments that have been carefully made show, that more cheese may be produced from the same quantity of milk in that breed than in those of the short-horned, as well as more butter from the same quantity of cream\*. And in Ireland the Craven breed afforded more butter than the Holderneffe†. Of the smaller breeds, the Alderney, the Suffolk polled, and the Kiloe or Scotch breeds, may be found the most profitable. In the dairies of the Isle of Wight, as well as those of some parts of Hampshire, the Alderneys prevail much, and are highly esteemed for butter. Two-thirds of the Suffolk polled breed, and one-third Alderney, have been recommended as constituting an excellent dairy, the milk being mixed‡.

But besides the milk there is another object to be attended to in forming a cow stock, which is, that they be sufficiently hardy for the situation. In this respect the long-horned breed is much superior to the short-horned cattle, from the difference in the thickness of their hides; and the Scotch is probably better than either. This breed and the long-horned are therefore the most proper for bleak, exposed situations.

As many of the mixed breeds afford excellent milkers, and in most of the genuine breeds there are great differences in the individuals, it may be the best mode, in order to establish a good dairy, whether for cheese or butter, for the farmer to breed from such cows, of whatever kind they may be, as he has found from experience the best for the purpose, without being at the trouble of purchasing the more expensive breeds. In this case good bulls should always be procured, as much is supposed to depend on the male.

In order to produce abundance of milk, and of a good quality, cows must at all times have plenty of food. Grass is the best food for this purpose, and that kind of grass which springs spontaneously on rich dry soils is the best of all||.

In the winter keeping of the cows, there are different methods in use; but in the southern parts of the island they do extremely well in warm sheltered yards, with open sheds, especially when plenty of litter, such as straw, stubble, fern, or other similar materials can be afforded for keeping the whole well bedded. In the

\* Young's Six Months Tour, Vol. II.

† Irish Tour, Vol. I.

‡ Annals of Agriculture, Vol. XXXII.

|| Anderson in Bath Papers.



northern districts, however, and wherever a proper supply of litter cannot be obtained, it is better to have them tied up in stalls, with raised standings, and sunk paved floors immediately behind them for receiving the dung and urine, as by these contrivances they may be kept perfectly clean without litter, and at the same time be more warm, as two cows may be confined in the same stall. The stalls should be kept constantly clean and well swept out.

In the management of the cows, it has been observed that, "if the temperature of the climate be such as to permit the cows to graze at ease throughout the day, they should be suffered to range on such pastures at freedom; but, if the cows are so much incommoded by the heat as to be prevented from eating through the day, they ought in that case to be taken into cool sheds for protection; where, after allowing them a proper time to ruminate, they should be supplied with abundance of green food fresh cut for the purpose, and given to them frequently, in small quantities, fresh and fresh, so as to induce them to eat it with pleasure. When the heat of the day is over, and they can remain abroad with ease, they may be again turned into the pasture, where they should be allowed to range with freedom all night during the mild weather of summer."

Cows are in general only milked twice a day; but, when "abundantly fed, they should probably be milked three times a day during the whole of the summer season: in the morning early, at noon, and in the evening just before night-fall. For, if they be milked only twice in the twenty-four hours, while they have abundance of succulent food, they will, as has been observed, yield a much smaller quantity of milk in the same time, than if they were milked three times.

"In the choice of persons for milking the cows, great caution should likewise be employed: for, if that operation be not carefully and properly performed, the quantity of the produce of the dairy will be greatly diminished. It should be a rule never to allow this important department to be entrusted without control to the management of any but very trusty servants; as the cows should always be treated with great gentleness."

It has been observed to be of great consequence to the produce of a dairy, that the cows should not drop their calves too early in the season. When that happens, they fall off in the quantity of milk in the autumn, when, owing to its superior richness, it is more valuable than at any other period. From the end of March to the end of April is the best time in the more northern districts that a cow can drop her calf, as she soon gets into good condition on the early grass, and yields a greater quantity of milk in the course of the season than those that calve either considerably



earlier or later. But in the southern parts of the island it is an advantage for them to calve much earlier.

In the management of cows in summer, there is a sameness in almost every district. They are usually kept on the oldest pastures on the farm: when these are at a distance from the farm-house, they are milked on the pastures; but otherwise they are brought home morning and evening for that purpose.

In winter the dry cows, that is, such as do not give milk, are fed on straw in the straw-yard; while those that are in milk, or are near calving, are kept in some inclosed pasture, or in sheds erected for the purpose, and maintained chiefly on hay. Where artificial grasses, turnips, cabbages, or potatoes, are cultivated on a large scale, the milch cows have a daily and regular allowance of one or other of these sorts of food during the winter and spring months. Potatoes in particular are admirable food for cows; as, while they tend to keep them in good condition, the quantity of milk is generally abundant and of good quality, both in respect to richness and flavour. In short, the dairy-farmer, in every part of the island, will find it for his interest to be attentive in feeding his cows\*.

These different sorts of food may be distributed for summer and winter in this manner:

In summer *red clover, saintfoin, lucern, burnet, and tares* may be made use of with great advantage. But in employing the first, great care should be taken to guard against injury either to the animals, or the quality of the butter or cheese being rendered of a bad kind or flavour by it. On poor chalky hills the second will be of the greatest importance to the dairy-farmer. Lucern and tares should always be employed in the way of soiling; in which method, where the cows have proper shade and sufficient water, they will be found of the utmost use, as they afford a very certain supply of food and go a great way. Besides, the cows are found to milk well in this management where proper attention is bestowed in the foddering of them. Some suppose it a method that can hardly be too strongly advised†. In Mr. Baker's experiments, a middle sized cow was found to consume in the proportion of from 90 to 100 pounds of green lucern in the course of twenty-four hours.

For winter, *hay, straw, cabbages, turnips, carrots, potatoes, cole, malt-grains, &c.* may be made use of. The keeping cows with hay is in general too expensive to afford the dairy-man an adequate profit: therefore, in order to lessen the expense of this sort of keep, other articles of the green and root kind must be had recourse to: till near the

\* Modern Agriculture, Vol. III.

† Annals of Agriculture, Vol. XXXII.



period of calving they may be supported on fresh threshed straw in cribs in the fold-yard, beginning with the worst and gradually proceeding to that which is of a better quality. Those in good condition should have the worst straw; but when it is not of the best kind, and the cows are of a valuable sort, they may be fed once a day with cabbages, turnips, or other similar sorts of food, in bins for the purpose. When within about a month or six weeks of calving, a little hay should be given at night, or the allowance of green food increased, and on the day of calving they should be confined, and have warm water; and for a fortnight after calving be very well fed with both hay and green food, in suitable divisions for the purpose. In this view the cabbages are extremely valuable, as the produce on the acre is large, and they afford much milk; but care must be taken to pick off all the dead and decayed leaves, which may be given to the young stock. A middle-sized cow will consume from one to two hundred pounds in a day, but seventy is supposed as much with straw as can be paid for by the produce\*. In Mr. Dodsworth's trials, a cow of fifty stone was found to eat twelve stone of this sort of food in the same time. An extent of this kind of crop proportioned to the dairy should always be provided†. The only objection to turnips as food for milch cows is their impairing the flavour of the butter: but they are a sort of food that affords much milk; and without this, or the preceding green food, a large dairy cannot perhaps be supported to much profit. A larger weight of this food than the former is consumed in the same time‡.

Carrots and potatoes are very advantageous sorts of food for cows where they are raised in great abundance; but even in such cases they can only be made use of with profit as a feed once or twice in a day with other sorts of food. It is out of the question that a cow could pay for being kept wholly on them. Cole, as being fed off in the field, can only be had recourse to on the firm dry soils; but in such situations it is a very profitable crop applied in this way, especially when used in succession to turnips in the spring months§. Malt-grains, where they can be had in plenty, are useful with other sorts of food, as producing a large proportion of thin milk. They are consequently better for the purposes of the milkman than the dairy-farmer.

Whatever kinds of green or succulent food may be used in the way of feeding dairy cows, experience has shown that great advantage may be derived from varying it as much as possible||, probably on the physiological principle that the

\* Annals of Agriculture, Vol. XXXII.

† Young's Six Months Tour, Vol. II.

‡ Ibid.

§ Ibid.

|| Wedge's Agricultural Report of Cheshire, 4to, p. 59.



novelty of stimulus is the most powerful in exciting the action and promoting the secretions of the system. The use of day and night pastures, which is a method employed in some districts, may also partly depend on this principle, and partly on that of better shade and water\*.

In the stocking of pastures with cows, it should always be done according to their goodness: such grass lands as afford in rent, tythe, and taxes, twenty-seven or eight shillings may support during the summer season in the proportion of a cow of fifty stones to an acre and a half with a few sheep. But in such as are not worth more than twenty shillings, one cow to two acres may be often fully sufficient.

In this management the rule should be for the pastures never to be too closely stocked.

In regard to the labour necessary in the management of dairy business, it will of course be different according to the difference of convenience and other circumstances; but a common dairy-maid can seldom manage more than twelve or fourteen cows in a perfect manner, especially where both butter and cheese are made. If she undertake more, she will require assistance in the dairy.

As the cows should not be more than an hour in milking, the maid cannot milk more than five or six; in a dairy of about eighteen cows, two assistants will consequently be required at such times; which in summer, when two milkings only are practised, should be at five o'clock in the morning and six at night. The work of the dairy must therefore be regulated in this proportion.

It is a good practice for the dairy-maid to constantly examine the cows separately after the milkers, especially when they cannot be fully depended upon; to see that the business has been perfectly performed; as, where the contrary is the case, loss may not only be sustained in the richest part of the milk †, but the cows be more subjected to disease.

\* Wedge's Agricultural Report of Cheshire, 4to, p. 59.

† The following facts stated by Dr. Anderson as the result of accurate experiments, in respect to the nature of milk and the proportion and separation of cream from it, are deserving of the particular attention of the dairy-farmer. It was found first, that of the milk that is drawn from any cow at one time, that which comes off at the first is always thinner, and of a much worse quality, than that which comes afterwards; and that the richness goes on, continually increasing, to the very last drop that can be drawn at that time.—Few persons are ignorant that the milk which is taken from the cow last of all at milking is richer than the other parts of it; but very few are aware of the greatness of the disproportion between the quality of the first and the last drawn milk from the same cow at one milking. The following facts in respect to this circumstance were ascertained many years ago, and have been confirmed by subsequent experiments and observations. Having taken several large tea-cups, exactly similar in size and shape, and filled them at regular intervals, the last being filled with the dregs of the milk; these



*Management of the Milk.*—The proper care of the milk, which is the next circumstance to be attended to, is of the greatest importance to the success of the dairy. After being brought from the cows, it should be passed through a sieve or strainer of hair or

were each weighed, so as to ascertain that the quantity of milk in each was precisely the same. From a great number of experiments, frequently repeated with many different cows, the result was in all cases thus:—The quantity of milk obtained from the first-drawn cup, in every case, was much smaller than from that which was last drawn; and those between afforded less or more as they were nearer the beginning or the end. It is unnecessary to specify intermediate proportions; but the quantity of cream obtained from the last-drawn cup, from some cows, exceeded that from the first in the proportion of 16 to 1. In other cows, however, and in particular circumstances, the disproportion was not quite so great; but in no case did it fall short of the rate of 8 to 1. Probably, upon an average of a great many cows, it might be found to run as 10 or 12 to 1.

In the next place, the difference in the quality of the cream obtained from the two cups was much greater than the difference in the quantity. In the first cup the cream was a thin tough film, and very white; but in the last of a thick butyraceous consistence, and of a glowing richness of colour, that no other kind of cream is ever found to possess.

And the difference in the quality of the milk that remained after the cream was separated, was perhaps still greater than either, in respect to the quantity or the quality of the cream. In the first cup it was a thin blueish liquid, as if a very large portion of water had been mixed with ordinary milk; while in the last cup it was of a thick consistence and yellow colour, more resembling cream than milk both in taste and appearance. From this experiment it appears, that the person who, by bad milking of his cows, loses but half a pint of his milk, loses in fact about as much cream as would be afforded by six or eight pints at the beginning; and besides, that part of the cream which alone can give richness and high flavour to the butter, where that is the object, is lost.

Secondly. That if milk be put up in a dish, and allowed to stand till it throws up cream, that portion of cream which rises first to the surface is richer in quality and greater in quantity than what rises in a second equal portion of time; and the cream that rises in the second interval of time is greater in quantity and richer in quality than that which rises in a third equal space of time; and that of the third than the fourth, and so on, decreasing in quantity and declining in quality continually as long as any rises to the surface. These experiments not having been, in this case, made with so much accuracy as in the former, the writer has not been enabled to ascertain the difference in the proportion that takes place in equal portions of time; but they have been so often repeated as not to leave any room to doubt the fact: and it will be allowed to be a fact of no small importance in the management of the dairy. It is not clear, however, but that a greater quantity of cream may upon the whole be obtained from the milk by taking it away at different times; but the process is so troublesome as not to be counter balanced by the increased quantity obtained; if, indeed, an additional quantity be thus obtained, which is not as yet fully ascertained.

Thirdly. That thick milk always throws up a smaller proportion of the cream it actually contains to the surface than milk that is thinner; but the cream is of a richer quality: and if water be added to that thick milk, it will afford a considerably greater quantity of cream than it would have done if allowed to remain pure; but its quality is at the same time greatly debased.—This is a fact that every person attentive to a dairy must have remarked; but no experiment has been made that could ascertain either the precise amount of



silver wire, fixed in the bottom of a large wooden bowl into the vessels that are destined for its reception. But few experiments have hitherto been made with the view of deciding the most advantageous method of disposing the milk for the pur-

the increased quantity of cream that might thus be obtained, or of the ratio in the decrease of its quality : but it ascertains the effects, at least, of mixing water with the milk in a dairy ; and the knowledge of this fact will enable attentive persons to follow that practice which they think will best promote their interest.

Fourthly. That milk which is put into a pail, bucket, or other proper vessel, and carried in it to any distance so as to be much agitated, and in part cooled before it be put into the milk-pans to settle for cream, never throws up so much nor so rich cream as if the same milk had been put into the milk-pans directly after it was milked.—In this case it is believed, that the loss of cream will be nearly in proportion to the time that has elapsed, and the agitation it has sustained after being drawn from the cow : but the author is not yet in possession of any experiments that sufficiently ascertain how much is to be ascribed to the time and the agitation taken separately.

From the whole of these facts and circumstances, the following corollaries are deducible : 1st, That it is of importance that the cows should be always milked as near the dairy as possible, to prevent the necessity of carrying and cooling the milk before it be put into the dishes : and as cows are much hurt by far driving, it must be a great advantage in a dairy-farm to have the principal grass-fields as near the dairy, or homestead, as possible. 2dly, That the practice of putting the milk of all the cows of a large dairy into one vessel, as it is milked, there to remain till the whole milking be finished before any part of it is put into the milk-pans, seems to be highly injudicious, not only on account of the loss that is sustained by agitation and cooling, but also, more especially, because it prevents the owner of the dairy from distinguishing the good from the bad cow's milk, so as to separate these from each other where it is necessary. He may thus have the whole of his dairy product greatly debased by the milk of one bad cow, for years together, without being able to discover it.

3dly, That if it be intended to make butter of a very fine quality, it will be advisable in all cases to keep the milk that is first drawn separate from that which comes last ; as it is obvious that if this be not done the quality of the butter will be greatly debased, without much augmenting its quantity. It is also obvious, that the quality of the butter will be improved in proportion to the smallness of the proportion of the last drawn milk that is retained ; so that those who wish to be singularly nice in this respect will do well to retain only a very small proportion of the last-drawn milk.

To those owners of dairies who have profit only in view, it must ever be a matter of trial and calculation, how far it is expedient for them to carry the improving of the quality of their butter, at the expense of diminishing its quantity. In different situations, prudence will point out different kinds of practice as most eligible ; and all persons must be left, after making accurate trials, to determine for themselves. It is likewise a consideration of no small importance, to determine in what way the inferior milk that is thus to be set apart, where fine butter is wanted, can be employed with the greatest profit.

4thly, That if the quality of the butter be the chief object attended to, it will be necessary not only to separate the first from the last-drawn milk, but also to take nothing but the cream that is first separated from the best milk, as it is this first rising cream alone that is of the prime quality. The remainder of the milk, which will be still sweet, may be either employed for the purpose of making sweet-milk cheeses,



pose of raising the cream in the largest proportion, and the shortest space of time: however, as the oily or butyraceous part of milk would seem to be diffused through the whole substance of the milk, and entangled among its particles, betwixt those of the serous and caseous kind, so as to be thrown up only in consequence of its possessing less specific gravity than the portion which is usually termed milk, from its becoming in a state of rest; it would seem that the most suitable method of placing it for the purpose of creaming well, and in the most expeditious manner, is that of very shallow pans, leads or trays, so as that it may not stand deeper than three or four inches at the most; as in this way there will not only be the least resistance afforded, but the greatest possible extent of surface for it to collect upon: by which means a larger proportion of cream is not only produced, but it is found from experience in the best dairy districts, that in consequence of the more expeditious cooling of the milk, the tendency to acidity in warm seasons is considerably

or it may be allowed to stand to throw up cream for making butter of an inferior quality, as circumstances may direct. 5thly, That, from the above facts, we are enabled to perceive that butter of the very best possible quality can only be obtained from a dairy of considerable extent, when judiciously managed; for when only a very small portion of each cow's milk can be set apart for throwing up cream, and when only a very small proportion of that cream can be reserved as of the prime quality, it follows that, unless the quantity of milk were upon the whole very considerable, the quantity of prime cream produced would be so small as to be scarcely worth the while for manufacturing separately. 6thly, That from these premises we are also led to draw another conclusion, extremely different from the opinion that is commonly entertained on this subject, viz. That it seems probable that the very best butter could only be with economy made in those dairies where the manufacture of cheese is the principal object. The reasons are obvious:—If only a small portion of the milk should be set apart for butter, all the rest may be made into cheese while it is yet warm from the cow and perfectly sweet; and if only that portion of cream which rises during the first three or four hours after milking is to be reserved for butter, the rich milk which is left after that cream is separated, being still perfectly sweet, may be converted into cheese with as great advantage nearly as the newly-milked milk itself. But as it is not probable that many persons could be found, who would be willing to purchase the very finest butter made in the manner above pointed out, at the price that would be sufficient to indemnify the farmer for his trouble in making it, these hints are thrown out merely to satisfy the curious in what way butter possessing this superior degree of excellence may be obtained, if they choose to be at the expense; but, for an ordinary market, the writer is satisfied, from experience and attentive observation, that if in general about the first drawn half of the milk be separated at each milking, and the remainder only be set up for producing cream, and if that milk be allowed to stand to throw up the whole of its cream, even till it begins sensibly to taste sourish, and if that cream be afterwards carefully managed, the butter thus obtained will be of a quality greatly superior to what can usually be obtained at market, and its quantity not considerably less than if the whole of the milk had been treated alike. This, therefore, is the practice that is thought most likely to suit the frugal farmer, as his butter, though of a superior quality, could be afforded at a price that would always insure it a rapid sale.



checked and retarded. No trials have been instituted so as to decide what sort of material is the most appropriate and conducive to this end: it is probable, however, that wood or stone is much better than lead, as being not only more easily kept clean and sweet in consequence of their being less disposed to fur, but from their being more safe, on account of their not being acted upon by the acid of the milk.

This is in some measure proved to be the most adviseable practice, from its being almost generally adopted in the best dairy management.

There is likewise another point on which further experiments are wanting, which is that of ascertaining the degrees of heat in which the different changes may take place with the greatest certainty and success at different seasons.

From the few trials that have been made on this subject, it is believed, that when the heat is from 50 to 55 degrees on Fahrenheit's thermometer, the separation of the cream from milk, which is the most important operation of the dairy, proceeds with the greatest regularity and in the most favourable manner. It is therefore thought that this will be found to be the temperature that ought to be aimed at: but it is not pretended to decide with precision; a considerable degree of latitude in this respect may perhaps be allowable: from the best observation it seems to be highly probable that when the heat exceeds 60 degrees, the operation becomes difficult and dangerous; and when it falls below the 40th degree, they can scarcely be carried forward with any degree of œconomy or propriety. Till further experiments therefore ascertain the exact point, it may be taken as a safe rule, that the heat should be kept up, if possible, between the 50th and 55th degree; and in order to ascertain this, a thermometer, graduated by Fahrenheit's scale, should be hung up perpetually in the milk-house, to give notice to the owner of any alterations in the temperature of the air, that may affect his interest\*.

It has not been yet shown, by any trials that can be fully depended upon, what is the length of time that the milk should remain in the pans or trays in order to afford the cream in the largest quantity before it is separated. Some suppose that this should depend upon the particular views of the dairy-man, and the degree of heat that is present at the period.

In a moderately warm temperature of the air, if very fine butter be intended, it should not be allowed to stand more than six or eight hours. For ordinary good butter it may safely be let stand twelve hours or more; but where the dairy is so large as to afford a sufficient quantity of cream, and where the very best butter is

\* Anderson in Bath Papers.



intended (the milk being to be converted to some other use while yet sweet), it may be separated after standing only two, three, or four hours\*. “In the general management of dairies, milk is never skimmed more than once; but in the county of Essex, as well as some others, it is the common practice to skim it three or four times, or till no more cream rise. In the business of separating the cream from the milk there are two methods pursued; that most generally practised is to skim it off with a skimming-dish, made either of tin or of wood. The other is adopted only where leads or cisterns are common, and where the milk is used for making skim-milk or two-meal cheeses; and, of course, before it coagulate, or acquire any degree of acidity. Towards the centre of the cistern there is a hole or pipe, which, before the milk be put in, is shut with a wooden stopper that rises several inches above the surface of the milk. When the milk is wanted for any of the purposes above mentioned, a vessel is placed under the pipe, and the stopper drawn up so far as to allow the milk to run off, but so gently, as that the surface of the cream may not be broken. The milk being thus gradually drained off, the cream sinks down, till it at last rests on the cistern; when the vessel containing the milk being removed, and another placed for the purpose of receiving the cream, the stopper is entirely drawn out, and the cream drops into the vessel†”. The first of these methods “requires a dexterity of manipulation that can be acquired by practice alone: but it is of great importance to the success of the dairy that it be well done; for, if any part of the cream be left, the quantity of butter will be diminished; and if any part of the milk be taken, its quality will be debased‡.”

When the cream has been “thus separated from the milk, it ought to be immediately put into a vessel by itself, to be kept till a proper quantity be collected for being made into butter: and no vessel can be better adapted for that purpose than a firm neat-made wooden barrel, in size proportioned to the extent of the dairy, open at one end, with a lid exactly fitted, to close it. In the under part of this vessel, close to the bottom, should be placed a cock, for drawing off from time to time any thin serous part of the milk that may chance to be generated; for, should this be allowed to remain, it acts upon the cream in a powerful manner, and greatly diminishes the richness of the quality of the butter. The inside of the opening of the barrel should be covered with a bit of close fine wire or silver gauze netting to keep back the cream, while the serum is allowed to pass; and the barrel on its stand should be inclined a little forward in the top, to allow the whole to run off§.

\* Anderson in Bath Papers.

† Ibid.

‡ Modern Agriculture, Vol. III.

§ Ibid.



“ It is difficult to state any particular period for its being kept in these reservoirs before churning, so different is the management in this particular in different places. About Epping, in Essex, which has been long in high repute for the superior quality of its butter, the cream is seldom kept above three or, at furthest, four days\*,” but always till there is a certain degree of acidity in the cream, either natural or artificial, as without that they cannot insure a good churning of butter: some keep a little old cream for this use; others use a little rennet, and some a little lemon juice†. And it was the practice in a large dairy in Suffolk, which had a high character for making butter of a superior quality, when the butter was to be sent directly to market, to churn the cream the second or third day; but when it was to be salted, to keep it a day or two longer, or till it had acquired a certain degree of acidity. The dairy-woman, who had had a long and extensive experience, accounted for her conduct in this respect by observing, that butter made from fresh cream was much better and pleasanter to the taste, but that it would not take in the salt so well, or keep so long, as that made from cream that had been longer kept‡.

It has been observed that those “ who have had little experience in the dairy, believe that no butter can be of the finest quality, except that which has been made from cream that has not been kept above one day; but this is a very great mistake. So far indeed is this opinion from being well founded, that it is in very few cases that even tolerably good butter can be obtained from cream that is not more than one day old. The separation of butter from cream only takes place after the cream has attained a certain degree of acidity. If it be agitated before that acidity has begun to take place, no butter can be obtained, and the agitation must be continued till the time that that sourness is produced; after which the butter begins to form. In summer, while the climature is warm, the beating may be, without very much difficulty, continued until the acidity be produced, so that butter may be got; but in this case the process is long and tedious, and the butter is, for the most part, of a soft consistence, and tough and gluey to the touch. If this process be attempted during the cold weather in winter, butter can scarcely be in any way obtained, unless by the application of some great degree of heat, which sometimes assists in producing a very inferior kind of butter, that is white, hard, and brittle, with very little taste, and almost unfit for any culinary purpose whatever§.” The judicious farmer should not attempt to imitate this practice, but allow his cream to remain in the vessel appropriated for keeping it, until it has acquired that proper degree of

\* Modern Agriculture, Vol. III.

† Abdy in Annals of Agriculture, Vol. XI.

‡ Modern Agriculture, Vol. III.

§ Anderson in Bath Papers.



acidity that fits it for being made into butter with great ease, and by a very moderate degree of agitation; by which process only very fine butter can be prepared.

The length of time cream may be kept before it attains the precise degree of acidity that is necessary to form the very best butter, and after that period before its quality be sensibly diminished, has not yet been well ascertained by experiment.

It is remarked by Doctor Anderson that “so little nicety has been observed in this respect by practical farmers, even those who have a high reputation for making good butter, that few of them ever think of observing any precise rule in this respect with regard to the different portions of their cream, seeing they in general make into butter all the cream they have collected since the former churning, so that the new and the old is all beaten up together; and he can find nothing like an uniform rule established among them as to the time that should intervene between one churning and another, that being usually determined by local or accidental circumstances. He is himself inclined to believe, that if the cream be carefully kept, and no serious matter allowed to lodge about it, a very great latitude may safely be admitted in this respect;” and though the exact length of time has not been determined, “it is certain that cream which has been kept three or four days in summer is in excellent condition for being made into butter; and he is inclined to believe, that from three days to seven may be found in general the best time for keeping cream before churning; though, if circumstances make it necessary, a considerable latitude in this respect may be allowed. If the farmer has such a quantity of cream as may be worth his while to churn once every day, there is nothing to prevent him from doing it. He has only to provide a separate vessel for holding the cream for each day he means it should stand before churning; if three days, three vessels; if four days, four vessels; and so on. Thus he may churn every day cream of three days old, or of four, or any other number of days old that he may incline. In the same manner, if it were found that the cream of two, of three, or of a greater number of days gathering, was required to make a proper churning, it might be easy so to contrive it as to churn every day, as will be obvious to any one who thinks upon the subject. In this way the operations of a dairy may be kept perfectly regular and easy\*.”

It is frequently a practice in Cheshire to churn the whole of the milk without separating any part of the cream from it. After milking, it is cooled, according to the heat of the weather in summer, in separate vessels for the purpose, and a certain degree of acidity brought on, and warmed in the winter by being set by the fire. In this way they

\* Anderson in Bath Papers.



obtain a greater quantity of butter, though of an inferior quality. By careful management, however, especially if a portion of the first-drawn milk be separated, very good butter may, it is supposed, be obtained; but the practice, on many accounts, is not to be recommended\*.

In summer, or while the cows are fed on grass, no art is requisite to give butter that colour which is agreeable to the purchaser or the consumer; but in the winter and spring months the dairy people find it necessary, in order to please their customers, to alter that tallowy appearance which is natural to butter in these seasons. This is effected by means of a little *arnetta*, which, after being reduced by trituration to as fine a powder as possible, is mixed with the cream before it is put into the churn, and in such quantities as, from experience, has been found necessary for giving the requisite appearance.

*Churning.*—As while the oily or butyraceous part of the milk is in the state of cream, the particles are not in a sufficiently concentrated state for producing an uniform substance, on account of the large portion of interposing serous fluid; in order to produce butter, it is therefore necessary to force out this by means of continued agitation in the process of churning. The cream or milk, after being separated and prepared as above, is to be put into the churn of the kind which is preferred, as there are several different sorts employed in different places, and agitated for some time, in order to effect the separation of the butter. "From the practice generally adopted in the best managed dairies of cooling the churn, by filling it for some time with cold water before churning in summer, and of warming it with scalding water when the weather is very cold in winter, and of putting in also cold or hot water among the cream in the churn occasionally, according to the season of the year," it is concluded "that cream possessing a proper temperature, whatever that temperature may be, is, among the most exact dairy farmers, considered essentially necessary in the making of good butter; which being admitted, it must follow that some churns may be better suited to the purpose than others—as such as admit a free supply of atmospheric air, and permit that which, from the violent agitation, has become overheated to escape, from their preserving that medium temperature which, it would appear, cream, in the course of making into butter, ought to possess, than such as are kept constantly shut up, or in which the air is only allowed to enter or escape occasionally by means of a small aperture†." It is probably on this account that the upright churn is still preferred in some dairies.

In this process much greater nicety is required than most persons seem to be

\* Anderson in Bath Papers.

† Modern Agriculture, Vol. III.



aware of. It has been observed, “that a few hasty irregular strokes may render the whole of the butter of scarcely any value,—that which, but for this circumstance, would have been of the finest quality. The owner of an extensive dairy should, therefore, be extremely attentive to this circumstance, and be at great pains to procure a proper person for managing this branch of the business\*.”

*Making of Butter.*—When, by the process of churning, or keeping the cream constantly in a state of motion, the butyraceous particles are separated from the milk, and united to each other, the mass is taken out of the churn and put into a large wooden bowl, or other convenient vessel, with some cold spring water which is perfectly pure; after which the dairy-maid kneads it well with her hands, or, what is better, a wooden spoon with a short handle, afterwards breaking it into as minute divisions as possible, and, by rolling and pressing it against the bottom and sides of the vessel, expresses and forces out any milk that it may contain. Upon this being well performed the goodness of the butter in a great measure depends. When it has been thus worked, the milky water is poured off, and an additional quantity of pure clean water put in; and the operations of kneading, breaking, and pressing, are again renewed, and continued till the water at last appears scarcely tinged with milk, which is the only proper criterion by which to determine when the butter has been sufficiently worked.

It has been observed by the above writer “that a considerable degree of strength, as well as of dexterity, is required in this manipulation. The thing wanted is to force out the milk entirely, with as little tawing of the butter as possible; for, if the milk be not entirely taken away, the butter will infallibly spoil in a short time; and if it be much worked, the butter will become tough and gluey, which greatly debases its quality†.”

In most cases a small quantity of salt is mixed with butter which is intended for immediate use; and when butter is salted, whether it be with a view to keeping or

\* Anderson in Bath Papers.

† In Holland the method of making butter, according to the account of Mr. Carew, as stated in the Agricultural Report of Middlesex, is this:—After milking the cows, the milk is not put into pans till it is quite cold. It is then stirred two or three times a day with a wooden spoon, to prevent the cream from separating from the milk; and if it can be stirred till the spoon will almost stand in it, it is deemed so much the better. When it is found to be sufficiently thick, it is put into the churn, and beaten for an hour. When the butter begins to form, a pint or more of cold water, according to the quantity of the milk, is poured in, to separate the butter from the milk. When the butter is taken out of the churn, it is washed and kneaded till the last water is perfectly clear and free from milk. By this method it is supposed that a greater quantity of butter is made from an equal quantity of milk. And the butter is said to be firmer and sweeter, and to keep longer, than that which is made in the ordinary mode which is in use in England. The buttermilk is also thought preferable. A churn is there thought better adapted to the purpose than a barrel.



for immediate sale, the salt is applied as soon as the milk has been extracted or removed in the manner just described. Part of the butter is spread on the bottom of another basin or *skel*, which has been previously washed and prepared for the purpose; and a quantity of salt being strewed over it, an additional layer of butter is then laid on; over this another sprinkling of salt, and so on alternately till the whole be salted to the proper degree, according to the use for which the butter is intended. When the whole is thus salted, the dairy-maid again kneads, breaks, and works it in such a manner as to make the salt mix intimately with it; and when she thinks she has fully effected this purpose, she pours some spring or other cold water over the whole; and, by again working the butter, washes it free from the brine, and from any milky substance, which by the salting, and the repetition of kneading, pressing, &c. may have been expressed.

The different operations of butter-making being thus performed, all that remains is to weigh and make it up into the form in which it is most saleable. The usual form in which it is exposed to sale is in rolls; but it is sometimes made into circular cakes of about three or four inches diameter, and about an inch thick, and on the top of which figures are impressed by means of a wooden print carved for the purpose. After the butter, in well-managed dairies, is weighed and made up for market, it is usually placed in cold water till the period for sending it to market arrives.

The quantity of butter produced from a given quantity of milk depends on a variety of particulars; as the quality of the milk, the age and quality of the pastures on which the cows are maintained, and whether the milk be allowed to stand a sufficient time to throw up the whole cream which it contains. But on a medium four gallons of milk will produce sixteen ounces of butter; and the quantity which a dairy of cows of any magnitude, in regard to numbers, may be supposed to yield, may be rated at six pounds each per week in summer, and from four to five in winter, according to the manner of feeding them. In Suffolk they find that four gallons and a half of milk afford a quart of cream, which, when made into butter, weighs one pound and three quarters. Mr. Abdy found the average quantity of butter made by a cow per week to be four pounds, of sixteen ounces, and the whole in nine months, one hundred and fifty-six pounds\*, besides the advantage of six shillings a-piece for three pigs.

| lbs.     | d.         | £. | s. | d. | s.                             | d. | £. | s. | d.   |
|----------|------------|----|----|----|--------------------------------|----|----|----|------|
| * 156 at | 10 per lb. | 6  | 10 | 0  | —But at the present price, 1 3 |    |    | 9  | 15 0 |
| Calf     | -          | 0  | 18 | 0  | ditto                          | -  | -  | 1  | 5 0  |
| 3 pigs   | -          | 0  | 18 | 0  | ditto                          | -  | -  | 1  | 10 0 |
|          |            | 8  | 6  | 0  |                                |    |    | 12 | 10 0 |



An inferior sort of butter is often made from whey, where cheese is the principal object of the dairy\*.

*Making of Cheese.*—In the process of cheese-making, as in most of the other operations of the dairy, there is a want of precision, from few experiments having been made, and those with but little chemical exactness. As the business stands at present, the whole is conducted at random by mere custom. The circumstances that would seem to particularly demand attention in this art are, the *season*; the *method of milking*; the *nature of the milk*; the *preparation of the rennet*; the *mode of colouring*; the *breaking and gathering the curd*; the *management of the cheese in the cheese-press*; the *method of salting*; and the *management in the cheese-room*.

*Season.*—It is supposed that the best season for making cheese is during those months

\* The methods of conducting the process in this case are thus stated by Mr. Donaldson:—

“In some dairies the whole whey, when taken from the cheese-tub, is put into skeels or other vessels, where it remains about twenty-four hours, when it is creamed, and the whey applied to the use of the calves and pigs, the latter of which are said to thrive as well on it after the latter has been taken from it as before. And the cream, when skimmed off the whey, is put into a brass pan and boiled, and afterwards set in pans or jars, where it remains till a sufficient quantity for a churning be procured, which in large dairies happens generally once, but sometimes twice, in the week.” In others “the green whey is put almost immediately from the cheese-tub into the furnace-pan, where it is scalded. When it acquires the proper degree of scalding heat, cold water, or some white whey is occasionally put in; this causes the whey to break, and throw up a thick white sort of scum, somewhat resembling cream, which the dairy-maid keeps constantly skimming off as it rises, and which she puts into cream jugs or jars, where it remains till the usual time of churning. In the dairies where the green whey is scalded, the runnings, except a little that is kept for the purpose of forcing the green whey when scalding, to throw up the cream, are usually set in skeels or jars, in the same manner as the milk from the cows; and the cream, when taken off, being added to that procured by scalding, is churned in the ordinary way.”

“In two experiments made for the purpose of ascertaining the nature of making butter from whey, Mr. Robertson found the result the same, though the process was differently conducted. In one, the whey had stood twenty-four hours after being taken from the curd before it was put to the fire; but in the other it was put on quite warm and fresh immediately from the curd; the quality as well as quantity were alike in both these methods.”

“The quantity of butter procured from whey is considerable: in two instances, where particular attention was bestowed to ascertain the fact, not less than about an ounce and a half from the gallon. In regard to the quality, it is unquestionably inferior to that of butter made from the cream of milk, or from the milk and cream churned together, but not so much so as stated by Mr. Marshall in his Rural Economy of Gloucestershire, which is one-third. In the Report of the County of Leicester it is indeed observed, “that whey butter sells for nine-pence per pound, when other butter sells from ten-pence to eleven-pence; and also, that eighteen cows will make about seventeen pounds” (sixteen ounces each) of whey-butter per week; which is a circumstance, Mr. Donaldson thinks, “that certainly merits the attention of those who are in the practice of making either *one-meal* or *two-meal* cheeses.”



when the cows can be fed on the pastures ; that is, from the beginning of May till towards the end of September, or, in favourable seasons, the middle of October. On many of the larger dairy farms in several districts, cheese is frequently made throughout the year ; but that made during the winter months is said to be considerably inferior in quality, and much longer in becoming fit for sale, or for use, than that which is made within the above period\*. In Gloucestershire the season of making *thin cheese* is from April to November ; but the principal one for making *thick* is during the months of May, June, and the beginning of July. If made later in the summer, they are found not to acquire a sufficient degree of firmness to be marketable the ensuing spring†. But where the cows are well fed in the winter season, in the manner advised above, good cheese may undoubtedly be made at that time.

*Milking.*—The times of milking are different in different cheese-districts : in Cheshire they are in the summer season at six o'clock both morning and evening, and in winter at day-light in the morning and immediately before dark in the evening. But in Wilts, Suffolk, and some other counties, the people are frequently employed in milking by four o'clock in the morning in summer ; and the business in a dairy of forty or fifty cows is nearly completed before the period at which it commences in Cheshire‡. The latter would seem the most preferable practice ; as when the cows are brought home to the farm-yard, which is the best method where the pastures are within a short distance, they are milked unfettered, and the business is over before the heat increases so much as to make the cows restless and unruly. The farmer himself, or some careful person, should always attend the milking of the cows, for the double purpose of seeing the work properly done, and carrying the milk in large buckets, into which it has been occasionally emptied from the pails, to the dairy, to be poured through a strainer into coolers for the purpose, or the cheese-tub, preparatory to applying the rennet. In all well-managed dairies particular attention should be paid to the thorough milking of the cows ; as where this is omitted the cows are not only apt to go dry, but become more liable to be diseased. Besides, it has been shown that the last part of the milk is very greatly superior in quality to that which is first drawn from the bag.

The expeditious cooling of the milk, by putting it into leaden or other pans, is found of much utility in retarding the process of fermentation in the summer season, and thereby preventing the milk from turning into a state of acidity. But in winter it is obviously unnecessary. It has been suggested, that when the season is hot the

\* Modern Agriculture.

† Ibid.

‡ Marshall's Rural Economy of Gloucestershire.



quality of the cheese might be improved, and the difficulty of its being made lessened, by cooling down the milk as soon as possible by repeatedly drawing off and returning it to the cooler.

*Quality of the Milk.*—It is obvious that on the quality of the milk the goodness of the cheese, with common management, must in a great measure depend. The quantity of cream that is used is generally in practice different, according as they are *one-meal* or *two-meal* cheeses.

In Cheshire “the general custom, however, in the best dairies, is to take about a pint of cream, when two-meal cheeses are made, from the night’s milk of twenty cows. In order to make cheese of the best quality and in the greatest abundance, it is admitted that the cream should remain in the milk; but whether the cream that is once separated from it can by any means be again so intimately united with it as not to undergo a decomposition in the after-process, admits of some doubt. There is, at least, no absurdity in attempting to prevent the separation of two bodies which it is the professed intention to unite again. If a cheese made entirely of the night’s milk on which the cream has risen be as rich as one made of new milk, all other circumstances being alike, it is a proof that milk and cream after being separated may, by heating alone, become as it were new milk again. Experiment alone can decide this point: but the practice here is to unite the milk and cream, as will be shown hereafter; and the dairymen say, that when so united it differs not from new milk as to the purposes of cheese-making\*.”

If the whole milking be directly made use of in its simple state for the cheese, it is denominated a *one-meal* cheese; but where two milkings are blended, or *two-meal* cheese made, the quality of the milk used differs considerably; in some cases the whole of the cream of the first meal is abstracted, and in all cases a certain portion. In some dairies the milk of the first meal is set in the leads or other vessels as usual; and as it is the evening’s milk that is in common added to the succeeding morning’s, the operation of cheese-making begins immediately after that of the morning milking is completed, as about five or six o’clock. The cream of the evening milk being skimmed off, the milk is carried and put into the cheese-tub, reserving sometimes a half, sometimes a third, but more frequently only three or four gallons, to be applied as below. The milk reserved, in any of these proportions, after being put into a brass pan and made scalding hot, by placing the pan on a furnace or in a vessel of hot water, is one half of it poured into the cheese-tub among the cold milk, and the other into the pan in which the cream had been put. The cream

\* Agricultural Report, 4to.



and the hot milk being intimately incorporated, the whole is poured into the cheese-tub, which by this time has received a great addition, if not the whole of the morning's milk, warm from the cows. Thus the different meals' milk forms, as it were, a fluid of the same nature, equal in quality and temperature, and to which the rennet is applied in the usual manner. This re-union, or, in the dairy phrase, *melting the cream*, is probably the best method practised; but it is, we believe, not so effectual in forming cheese of the best quality as that where the milk is entirely new.

In making *skim-milk-cheeses* the milk is set in the leads or pans as usual, in which state it remains longer or shorter, according to the weather, care being taken to skim off the cream, or to drain off the milk, in proper time, before it begins to acquire a sourish taste. If that should at any time happen, either from the excessive heat of the weather, or owing to some inattention in the general management; in place of putting the skim-milk upon the furnace to give it that degree of heat supposed to be necessary for facilitating the coagulation after the rennet is applied, and which is the usual practice, the method is, to put it directly into the cheese-tub, and to pour in such a quantity of hot water as will give the wished-for temperature. By this means, the risk of the milk breaking while heating on the furnace, which when not quite sweet and fresh it is apt to do, is avoided without inconvenience in other respects. In this sort of milk it is necessary to add somewhat more rennet than is usually applied to a similar quantity of milk, which contains either the whole or a great portion of the cream.

*Preparing the Rennet.*—Milk may be coagulated, or turned into a curdled state, by the application of any sort of acid; but that substance which is most commonly used in the making of cheese is the *maw* or stomach of a young calf prepared for the purpose, and which is generally denominated *rennet*. The maws, which usually contain a curdled kind of substance, on being purchased from the butcher, are opened, and the curd or thick substance taken out: this, having been repeatedly washed in cold water, as well as the bag which contained it, is again replaced with a considerable addition of salt, and then packed in a jar, into which is poured a very strong brine of salt and water. In many instances the maws are allowed to remain in this state for about twelve months before using; in others, after having remained for some time covered with the brine, they are taken out; and an additional quantity of salt being applied, they are hung up in the dairy, or some other convenient place, to dry, and remain in that state till wanted for use.

But, from the preparation in this mode being made at different times, there



must be a great difference in their strength, and of course in their effects, either when made use of after being steeped in some sort of liquid, or in the piece.

Whether the proportion of rennet necessary for a season be kept in *brine* or *pickled*, and afterwards dried, the best method, as attended with the greatest degree of certainty in regard to its being of equal strength and quality, is to extract the substance from the whole at once. This is frequently the case in Cheshire, but in few other districts.

In preparing these substances it is therefore, probably, a better practice to put the whole of the maws into an open vessel, and to pour in two or three pints of spring water for each, according to the number. In this state they should be allowed to stand about twenty-four hours. They then may be taken out and put into other vessels, with about half the quantity of water, and allowed to remain for a like period, then wholly removed and thrown aside as no longer of use, and the first and second infusions mixed together, and strained through a sieve into a jar or other vessel, a considerable quantity of salt being added. This liquor is then fit for use, and requires no after-management beyond that of taking off the scum that usually rises to the top, and of adding a little salt when that already in the jar is nearly dissolved. About half a pint of this preparation, wine measure, is mostly sufficient for coagulating such a quantity of milk as will make sixty pounds of cheese. When a portion is taken out, the liquor should be well stirred up. Other modes of preparing this substance are in use, but perhaps without affording any superiority.

*Colouring.*—From the practice of colouring cheese having been so long common in the cheese-districts, it is probable that those of the best quality would be in a great measure unsaleable, if they did not possess the requisite colour. The degree of colour is regulated chiefly by the name under which it is intended the cheese should be sold. The introduction of this practice originated in the intention of conveying an idea of richness; but the leanest cheese always requires the greatest quantity of colour to bring it to the proper appearance\*. The material which is usually employed for this purpose is Spanish arnetta. The weight of a guinea and a half of it is considered in Cheshire sufficient for a cheese of 60lbs.; and in Gloucestershire an ounce is the common allowance to the hundred weight.—There are different ways of preparing as well as of applying it. The method used in Cheshire is, when the dye is wanted in the morning, to tie up the necessary quantity of pounded arnetta in a linen rag, and to put it into about half a pint of warm water in the preceding evening. In the morning, immediately before applying the rennet, the infusion of arnetta is poured into the milk, and the mixture is then well stirred about, so as to make the

\* Cheshire 4to Report.



milk and the dye incorporate intimately together. In other districts it is common to rub a piece of unpounded arnetta, after having been previously dipped in milk, on a smooth stone, in the same manner that paint is ground. The colouring thus obtained is mixed with the milk in the cheese-tub, in the manner and at the period before mentioned, care being taken to prevent any of the unreduced particles of arnetta from falling into it.

*Setting the Curd.*—The degree of temperature which milk ought to possess, so as to be in the best possible condition for applying the rennet, is a point by no means fully decided. It is, however, admitted that the quantity and quality, or texture of the curd, depend much on the length of time the curd is in forming, and that on the quantity and strength of the coagulum employed, the state of the atmosphere, and the heat of the milk, at the period of its being mixed\*. In this matter the

\* Mr. Marshall observes that "it is known from daily experience, that the warmer the milk is when the rennet is put to it, the sooner it will coagulate with a given quantity of rennet of a given strength. It is equally well known, that the cooler the milk, and the longer it is in coagulating, the more tender and delicate the curd becomes: on the contrary, if the milk be too hot, and the coagulation takes place too rapidly, the curd proves tough and harsh. But it seems to be a fact equally well established, that a cheese made from milk which has been coolly and slowly coagulated, is longer before it becomes marketable than one made from milk which has undergone a less deliberate coagulation; and which being drier, and of a harsher texture, sooner becomes cheese and fit for the taster. Therefore, the great art in this stage of the process lies in the degree of warmth of the milk when *set*; that is, when the rennet is put to it; or in the degree of heat retained by the curd when it *comes*, that is, when the coagulation has sufficiently taken place; or in the length of time between the setting and coming. Which length of time may be regulated either by the degree of the warmth of the milk when set; or by the state of warmth in which it is kept during the time of coagulation; or by the quantity and strength, taken jointly, of the rennet."

With a view to obtain some information on this subject, he made the following experiments:—

"In 1781, June 5, twenty-three gallons of milk, heated to ninety-six degrees of Fahrenheit's scale, with two tea-cupfuls of weakish rennet, came in one hour; the curd delicate and good. 6th. The same quantity of milk, of the same heat, with one tea-cupful of rennet, came in nearly the same time; the curd somewhat tough; owing, probably, to the milk having been burnt to the kettle in which it was heated. 7th. Twenty-seven gallons of milk, heated to ninety-four degrees, with the same quantity of rennet, came in about two hours; the curd very good. 8th. Twenty-six gallons of milk, heated to one hundred and two degrees, with one tea-cupful of rennet, came in two hours and a half; curd very good. 9th. Twenty-five gallons of milk, heated to one hundred degrees, with a tea-cupful and a half of rennet, came in about one hour and a half; the curd good, but somewhat tough; owing, perhaps, to the milk being kept too warm in the cheese-tub, by being covered up close with a thick cloth. It is noted, that on the seventh and eighth the whey retained a heat of about eighty-eight degrees, whereas the whey this morning was ninety-two degrees: so that, perhaps, it is not the heat when it is set, but the heat when it comes, which gives the quality of the curd. 10th. Twenty-five gallons: ninety-six degrees: two cups, uncovered, came in two hours and a quarter: whey eighty-seven degrees: curd very



practice of almost every particular dairy differs from that of another. That which is adopted in Cheshire is, that the lowest degree of heat which milk ought to possess, when the rennet is applied, is one half of that of the milk from the cow ;

tender. 11th. Twenty-three gallons : one hundred degrees : more than a tea-cup : uncovered : did not come in two hours ; owing to the rennet being lower in strength than before : therefore, added a little more rennet : which brought it in about three hours from the first setting : the whey eighty-seven degrees : the curd uncommonly tender. 12th. Twenty-four gallons of milk : one hundred degrees : two cups of rennet : uncovered : came in two hours : whey eighty-nine degrees : curd uncommonly tender. 13th. Twenty-eight gallons of milk : ninety-two degrees : three cups (say strongly renneted) covered up with a coarse linen cloth : came in one hour and a half : whey eighty-six degrees : curd very good, and of a very fine colour : though perhaps would have handled tenderer if it had not stood some time after it came before it was broken up. Perhaps, says he, much depends on its being broken up in the critical minute. 14th. Twenty-eight gallons : one hundred degrees : two cupfuls : uncovered : came in one hour and a quarter : whey ninety-four degrees : curd somewhat harsh, but of a good colour. The change of colour, therefore, he thinks owing to the change of pasture.

“ He here notes, that the milk should be covered to make it come together : this came and grew hard at the bottom half an hour before it was set at the top. 15th. Twenty-eight gallons : milk heated to ninety-five degrees : with two cups of rennet ; and covered after it had stood three quarters of an hour : came in one hour and a half : whey eighty-nine degrees (the morning warm) : curd very good and tender. 16th. Thirty gallons of milk heated to one hundred and three degrees, but lowered by two pails full of cold water to ninety-six degrees ; with two cups and a half of rennet ; and kept close covered : came in one hour : whey ninety-four degrees : curd pretty good, but not sufficiently tender. 17th. Twenty-eight gallons : ninety-seven degrees : two cups and a half : covered ; but not close : came in one hour and a half : whey not tried : curd somewhat tough. It is noted, that the toughness was owing, perhaps, to some milk of a new-calved cow being among it. And, also, to try the exact heat of milk immediately from the cow, immersed a dish in the pail while milking. After it had lain long enough to receive a degree of heat equal to that of the milk in the pail, emptied it, and immediately milked into it from the teat (the cow being at this time about half milked) ; the heat ninety-five degrees ; and likewise, that the cheeses of yesterday (the 16th of June) press remarkably elastic, and spongy, like a fungus : perhaps owing to the milk's coming too hot ; or perhaps to two or three of the cows being then a-bulling ; or perhaps, being made thicker than usual, the press was not heavy enough for them : or perhaps this ill quality is owing to the cold water being put into the milk. He afterwards found that milk of a cow, on the day of amour, retained, after having stood for some time in the pail after milking, ninety-eight degrees of heat. This shows that the state, if not the quality, of the milk is altered by the heat of the cow ; and a cautious dairy-woman always endeavours to keep such milk out of her cheese-tub.

“ June 18th. Thirty gallons : ninety-five degrees : covered : came in one hour and a half : whey ninety-two degrees : curd pretty good. 19th. Thirty gallons : ninety-two degrees : two cups covered : curd very good. 21st. Thirty gallons : ninety-eight degrees : lowered by half a pail of cold water to ninety-five degrees : the curd good ; but the cheeses, like those of the 16th press, hollow and spongy. Therefore it is probable, from these two incidents, that lowering the heat of the milk with cold water has an evil effect. 23d. (Evening) fifteen gallons of new milk warm from the cow, retaining



the highest about twice the natural warmth. From this it is inferred, “that by the time a large dairy of cows can be milked, and the milk be put together for the purpose of artificial coagulation, the dairy-maid will not err materially by applying the rennet immediately afterwards\*.” This rule is however very uncertain, and liable to exception, on account of the variation in the seasons, and the frequent and great changes that take place in the state of the weather in the same season. Accordingly, “in all dairies remarkable for cheese of a superior quality, the heat of the milk, before the rennet is applied, is raised or lowered, by the addition of warm milk or of cold water, to that degree which, in the practice of the particular dairy, is found from experience the most eligible†.” The milk produced on poor clayey lands is found to require more warming than that afforded by such as are rich, for where this is much heated the process is rendered more difficult. The frothy matter arising in consequence of the air that is entangled with the new milk in pouring it into the cheese-tub, is in all cases carefully skimmed off, and put into the cream-vessels.

It is thought “surprising that in large dairies the use of the thermometer is not as well known as that of the *skimming-dish*—as to ascertain with precision, by a course of well-conducted experiments, the temperature the most proper for milk to possess at the time the rennet is applied, could not fail to be greatly in favour of the quality of the cheese, and would, in all probability, tend to prevent the cracking, blistering,

a heat of ninety-two degrees, with two cups and a half of new weak rennet, and closely covered, came in three quarters of an hour: whey eighty-eight degrees: curd very delicate and good. 25th. Forty gallons of half-skimmed milk, heated to eighty seven degrees, with three cups of rennet, slightly covered, came in three quarters of an hour: whey seventy-nine degrees: curd remarkably good of this sort. On September 8, in observing the effect of some remarkable strong rennet, he found that an ordinary tea-spoonful coagulated sufficiently upwards of forty gallons of milk, heated to only eighty-eight degrees, in thirty-five minutes.

“From the whole of these experiments it appears, he thinks, that curd of a good quality may be obtained from milk heated from 87 to 103 degrees of Fahrenheit’s thermometer; provided the rennet be so proportioned that the time of coagulation be from three quarters of an hour to two hours and a half; and provided the milk be kept properly covered during the process of coagulation. And from these as well as a variety of other trials, which he made in the course of the summer, it appears to him at present, that 80 to 90 are the proper degrees of heat; that from one to two hours is the proper time of coagulation; and that the milk ought to be covered so as to lose in the process about five degrees of its original heat. But, says he, climature, seasons, the weather and the pasture, may require that these bounds should sometimes be broken. A few observations, made in one season, and in one place, how accurately soever they may have been taken, are by no means adequate to the entire illustration of this very abstruse subject.”

\* Modern Agriculture, Vol. III.

† Ibid.



and hoving, which so frequently take place in cheese in consequence of some mismanagement in the making\*.

An instrument has been lately invented†, which, if found on experience to answer, must have the effect of throwing a great deal of light on the whole system of dairy-husbandry, and must be the means, in time, of reducing the business of butter- and cheese-making, which is at present carried on without any established rules by which the operator can be certainly guided, to something like fixed invariable principles. It is termed a lactometer. By the use of this instrument, together with the thermometer, and by discovering a mean whereby to ascertain the strength and quality of the rennet, and the proportion which is necessary to be used for coagulating a given quantity of milk, Mr. Donaldson supposes the management of a dairy where cheese is made would be greatly improved. Practice is the only means by which the operator can acquire a proper knowledge of this branch of the business; but the consequences of proper or improper conduct are well known in every cheese-dairy; as, when the coagulation is accelerated or retarded beyond the proper time, which in making a 60lb.-cheese is reckoned an hour and a half, either by giving too much or too little rennet, or by applying it when the milk is too hot or too cold, not only the quantity of the curd is diminished, but the quality in either case materially affected. In the former case it becomes of a tough gluey texture; in the latter it is too tender. After the rennet has been applied, the milk-tub is covered up by a board, over which is laid a linen cloth; and having stood the usual time, the operator, on finding that the coagulation is completed, proceeds with the work of separating the curd from the whey.

*Breaking and gathering the Curd.*—Though this business may appear simple and uniform, there are few particulars in the art of cheese-making wherein so great a difference is observable in practice. In some dairies the curd is at first broken or cut in various directions with a cheese-knife, an instrument made for the purpose, and used with a view of making the whey separate easily, and without carrying off with it any richness from the curd. After these first incisions, some time is allowed for the broken curd to subside. The knife is then again used, and more freely than before; and while the operator stirs up the unbroken curd from the bottom with the skimming-dish in one hand, the larger pieces of curd are cut with the knife held in the other. Having thoroughly broken the curd, and allowed some time for its subsiding, the operator begins to take off the whey with the skimming-dish. In other

\* Donaldson's Present State of Husbandry, Vol. III.

† By Mr. Dicus of Liverpool.



dairies, not less celebrated for good cheese, the skimming-dish only is used in breaking the curd; and to facilitate the operation of separating the whey from the curd, some of the whey that first rises to the top is skimmed off, and being either heated or cooled, according to the state of the weather, and the required consistence of the curd, is again returned into the cheese-tub, and after remaining a little time the whole is laded off in the usual manner. All the whey that can be extracted without pressure having been removed, and the cheese-tub being raised at one side, the curd is collected into a mass, and at first pressed with the back of the skimming-dish. When no more whey can be discharged by this means, others more violent are adopted: the curd is in many cases cut with the cheese-knife, as before, to give vent to the whey, and is then pressed as hard as possible with the hands; in others, a considerable weight is frequently applied. The curd having been in a great measure separated from the whey, it is put into two or three pans, or other vessels, and the cheesemakers break it with their hands as fine as possible; in the course of doing which, a proper quantity of salt is scattered over the curd, and intimately mixed therewith\*.

In Gloucestershire, when the curd is broken to the requisite fineness, it is again returned into the cheese-tub, where it is scalded, by pouring over the minutely broken curd a pailful of hot water, or of whey, or of whey and water mixed. After the scalding water or whey is applied; the whole is briskly stirred; and being allowed to stand for some time, for the curd to settle at the bottom of the tub, the scalding materials are skimmed or poured off; and the curd being pressed as before, so that no more whey can be extracted, it is put into the vat, and pressed in the common way. When it is properly broken, rubbed, and salted, a cloth is spread over the cheese-vat; and the broken curd being packed into it, and covered up with the cloth, a board is laid over the vat, and a weight, heavy in proportion to the quantity of curd, placed upon it; by which means the remaining whey is pressed out†.

Mr. Marshall observes, that "it seems to be understood, that different grounds require different kinds of scalding liquor. The quantity is in proportion to the quantity of curd, enough to float the curd,—and make the mixture easy to be stirred about with the dish. Part of it is heated to near boiling heat, and this lowered with cold liquid to a heat proportioned to the state of the curd: soft curd is scalded hot, hard curd with cooler liquid. In scalding, therefore, the dairy-woman has a remedy for any misjudgment her sense of feeling may have led her into in the stage of coagulation: let the curd come too soft or too hard, she can bring it to the desired texture by the heat of the scalding liquid.

\* Donaldson's Present State of Husbandry, Vol. III.

† Ibid.



And here seems to hinge, principally, the superior skill of the Gloucestershire dairy-woman:—by running the milk cool, she can, in scalding, correct any error which has been committed in the former operation.”

Extensive dairies should always be plentifully furnished with vats of different sizes, as, when three or four cheeses are made at each meal, a number of vats become actually in use; and if there are not still a number empty, the operator becomes confined in choice, and cannot proportion exactly the vats to the quantity of curd in the cheese-tub; and by keeping a little overplus curd from meal to meal a whole cheese is often spoiled\*.

\* Mr. Price on the authority of Signor Vitabni gives the following as the method of making Parmesan cheese:—It is “to put, at ten o'clock in the morning, five *brents* and a half of milk, each *brent* about forty-eight quarts, into a large copper, which turns on a crane, over a slow wood-fire, made about two feet below the surface of the ground; the milk is stirred from time to time; and about eleven o'clock, when just luke warm, or considerably under blood-heat, a ball of rennet as big as a large walnut is squeezed through a cloth into the milk, which is kept stirring. By the help of the crane the copper is turned from over the fire, and let stand till a few minutes past twelve; at which time the rennet has sufficiently operated. It is now stirred up and left to stand a short time. Part of the whey is then taken out, and the copper again turned over a fire sufficiently brisk to give a strongish heat, but below that of boiling. A quarter of an ounce of saffron is now put in to give it a little colour; and it is well stirred from time to time. The dairy-man frequently feels the curd. When the small, and, as it were, the granulated parts feel rather firm, which is in about an hour and a half, the copper is taken from the fire, and the curd left to fall to the bottom. Part of the whey is now taken out, and the curd brought up in a coarse cloth hanging together in a tough state. It is then put into a hoop, and about half a hundred weight laid upon it for about an hour; after which the cloth is taken off, and the cheese placed on a shelf in the same hoop. At the end of two, or from that to three days, it is sprinkled all over with salt; the same is repeated every second day for about forty or forty-five days, after which no further attention is required. While salting, they generally place two cheeses one upon another; in which state they are said to take the salt better than singly.”

In making Stilton cheese, the process, according to the Agricultural Report of Leicestershire, is this: “The night's cream is put into the morning's new milk with the rennet, and when the curd is come it is not broken as is done with other cheeses, but taken out with a soil-dish altogether, and placed in a sieve to drain gradually; and as it drains kept gradually pressed, till it becomes firm and dry; then placed in a wooden hoop, and afterwards kept dry on boards, turned frequently with cloth binders round it, which are tightened as occasion requires.”

The method of making green cheese is this: “For a cheese of ten or twelve pounds weight, about two handfuls of sage and one of marigold leaves, and a little parsley, are bruised and steeped one night in milk. Next morning the greened milk is strained off, and mixed with about one third of the whole quantity to be run. The green and the white milks are then run separately, keeping the two curds apart until they be ready for vatting. The method of mixing them depends on the fancy of the maker. Some crumble the two together, mixing them evenly and intimately; others break the green curd into irregular fragments, or cut it out in regular figures with tins for this purpose. In vatting it the fragments or figures are placed on the outsides.



Having made choice of a vat or vats, proportioned to the quantity of curd, so that the cheese, when fully pressed, shall neither-over-nor under-fill, the operator spreads a cheese-cloth loosely over the vat, into which he re-breaks the curd, carefully squeezing every part of it in the hand; and, having filled the vat heaped up, and rounded above its top, folds over the cloth, and places it in the press.

Where the cheeses usually made are of a large size, as in Cheshire, the operator thrusts a number of iron skewers, through holes made in the sides of the vat for the purpose, into the curd in various directions. These being withdrawn, the openings made by them serve as so many drains for permitting the whey to run off. When the whey, instead of running freely, only falls in drops, the weight is removed, and the curd rebroken, and, being again put into the vat, is managed in the same manner as before, and repeated while a drop of whey can be extracted. The curd being now almost entirely freed from the whey, it is again placed in the vat, a clean cloth having been previously spread for the purpose of receiving and inclosing it\*.

*Management in the Press.*—After the vat has been properly placed in the press, a suitable degree of pressure is applied, which is more or less according to the sizes of the cheeses. In all large dairies there are two or three presses, all varying in respect to power, weight, or pressure. As soon as the vat is placed in the press, and the weight applied, skewers are again thrust in through the holes in the sides of the vat: this is done repeatedly during the first day the vat is in the press. From the time the vat is first placed in the press, till it is again taken out, does not in common exceed two or three hours. When taken out, the cheese is put into a vessel with warm or hot whey, in order to hardening its coat or skin, where it stands for an hour or two; it is then taken out, wiped dry, and after having remained some time to cool, is covered with a clean dry cloth; and the vat being wiped dry, and the cheese replaced, it is again put into the press. In the evening, supposing the cheese to have been made in the morning, which is the common time, it is again taken out of the vat, and another dry cloth being applied, is returned and replaced, what was formerly the upper becoming now the under side. In this manner it is taken out, wrapped in clean cloths, and turned in the vat twice a-day for two days, when it is finally removed†. Cloths of finer qualities are made use of at the different turnings, in order that as little of their impression as possible may be left on the cheese.

The bottom of the vat is first set with them, crumbling the white or yellow curd among them. As the vat fills, others are placed at the edges, and the remainder buried flush with the top." The after-treatment is the same as that of plain cheeses.

\* Cheshire 4to Report.

† Donaldson's Present State of Husbandry, Vol. III.



*Salting.*—After the cheese has been at last removed from the press, it is carried to the salting-house, and placed in the vat in a tub filled to a considerable depth with brine, in which it stands for several days, being regularly turned once at least every day. The vat is then removed from the brine-tub; and the cheese being taken out is placed on the salting-bench, where it stands for eight or ten days, salt being carefully rubbed over the whole every day during that period. When the cheese is of a large size, it is commonly surrounded with a wooden hoop, or fillet of cloth, to prevent renting. After it is supposed to be sufficiently salted, it is washed in warm water or whey, and, when well dried with a cloth, is placed on what is called the drying-bench, where it remains an equal length of time before it is removed to the keeping-house or cheese-chamber. In some dairies, the new cheeses are not put in brine, but kept in the vats on the salting-benches; and after being rubbed with salt, and turned in the vats daily for a week or ten days, the vats are removed, and the cheeses managed as above. In other dairies the cheeses are salted while the operation of pressing is performing. At every time they are taken out of the press for the purpose of being turned in the vats, they are well rubbed with salt, which for small thin cheeses, such as are commonly made in Wiltshire and Gloucestershire, is found to be sufficient; and therefore, when taken for the last time from the press, in place of any more salt being applied, they are set at once upon the drying-benches. In fact, the practice of immersing new-made cheeses in brine is only adopted where they are of so large a size that rubbing salt on the outside would not be sufficient for answering the intended purpose\*.

*Management in the Cheese-room.*—After the cheeses have been properly salted, and have acquired a competent degree of dryness, they are carried from the salting-house to the cheese-room, where, after being smeared with fresh butter, they are laid on the floor, or on shelves for the purpose. For the first ten days or a fortnight they are pretty smartly rubbed every day, and the smearing with butter repeated; but after that period it is only necessary to rub them two or three times a week: yet they should be turned every day while in the dairy-man's possession, which is longer or shorter according to the season of the year, and the demand. In order to hasten the maturation and coating of the cheese, the temperature of the room should be uniform and rather warm. In some cases the floors are prepared by being rubbed over with different green vegetable substances, such as bean-tops, &c. and in others covered with dry substances; but these are probably unnecessary.

The produce of a dairy of cows, where the milk is converted into cheese, is

\* Donaldson's Present State of Husbandry, Vol. III.



variously stated by different farmers. In some districts two hundred weight and a half from each cow, whether a good or bad milker, if at all in milk, is considered a good annual return. In others, the average runs as high as three; and in the county of Wiltshire in particular from three and a half to four is the usual quantity. From accurate calculations made by Mr. Marshall, and these several times repeated, he found that in Gloucestershire about fifteen gallons of milk were requisite for making little more than eleven pounds of two-meal cheese, and that one gallon of new milk produced a pound of curd. It is the general opinion of dairy-farmers, that the produce of from two and a half to three and a half acres of land is necessary to maintain a cow all the year round. "Taking, therefore, the medium of the three averages of cheese above mentioned (amounting to 355lbs. from each cow), the quantity of cheese by the acre is 118lbs.\*" Every calculation of this kind must, however, be extremely vague and uncertain†. The correctness of this is, however, to a considerable degree confirmed by Sir William Petty's Statement, in his Political Economy of Ireland, in regard to the quantity of milk which he supposed the cows in that country to yield in the year, viz. "for ninety days three gallons, for other ninety days one gallon; for the next ninety days a quarter of a gallon, and for the remainder of the year none, making in all three hundred and eighty-four gallons; which, considering that in every dairy a certain quantity of cream is abstracted before the milk is put into the cheese-tub, it may be supposed, when converted into one-meal or two-meal cheeses, to make little more or less than 355lbs. as has been just stated."

It is obvious that, in both the butter- and cheese-dairy, a great part of the profit must necessarily arise from the keeping and fattening of hogs. In this intention the skim-milk, butter-milk, and cheese-whey, should be converted to the purpose for which they are the most adapted, which would seem to be that of supporting fows that have pigs, and rearing young pigs. It has been observed that "in these applications they are better than any other article of food within the farmer's command, that is to be had equally cheap; and by means of keeping a number of breeding fows, proportioned to this use of the milk and whey of the dairy, and making a

\* Donaldson's Present State of Husbandry, Vol. III.

† It has been stated by the author of the Agricultural Report of Somersetshire, that the gross produce of a cheese-dairy frequently averages twelve pounds the cow, and in particular cases fourteen pounds: "but this can only be done," says he, "when cheese is at the present enormous price of near sixpence per pound twelve months old; and fat hogs at sixpence per pound." The advance on both these articles has been considerable since the above was written, so that the profit must now stand much higher.



proper provision for the other sort of hogs, so that they need not rob this application, the most profit possible will be made of these important objects to the farmer, by his cows and swine†." In this system of management it is of vast advantage to have the hog-sties convenient to the dairy, with suitable sunk cisterns, properly formed for the reception and retention of the milk, whey, &c., which should be conveyed to them by pipes from the lip of the cheese-press, and a receiver on the outside of the dairy or scalding-room, so that every thing may be taken away without the labour of being carried‡, and nothing be wasted. Mr. Abdey, in speaking of the butter-dairies of Epping, remarks, that the farmers there buy pigs

The following estimate, made at that time, of the expenses and produce of a dairy, where both the land and cows were of the *first quality*, may in some degree show the advantage of this management :

## Dairy Twenty Cows.

| Dr.                                         | l.  | s. | d. | Cr.                             | l.  | s. | d. |
|---------------------------------------------|-----|----|----|---------------------------------|-----|----|----|
| To two milkers, forty weeks, at 3s. perwk.  | 6   | 0  | 0  | By ninety hundred of cheese, at |     |    |    |
| To a man's labour, winter serving cattle,   |     |    |    | 45s.*                           | 202 | 10 | 0  |
| changing their pasture, selling cheese, &c. | 4   | 0  | 0  | By calves                       | 15  | 0  | 0  |
| To dairy women, 4s. 6d. per week            | 11  | 14 | 0  | By butter                       | 10  | 0  | 0  |
| To dairy utensils, candles, salt, brushes,  |     |    |    | By hogs                         | 25  | 0  | 0  |
| mops, and all other articles                | 4   | 6  | 0  |                                 |     |    |    |
| To arnetta                                  | 1   | 0  | 0  |                                 | 252 | 10 | 0  |
| To rent, thirty acres of summer pasture,    |     |    |    |                                 |     |    |    |
| 40s.                                        | 60  | 0  | 0  |                                 |     |    |    |
| To skimming the same, and making six        |     |    |    |                                 |     |    |    |
| tons of hay                                 | 3   | 0  | 0  |                                 |     |    |    |
| To rent of fifteen acres mown ground, 40s.  | 30  | 0  | 0  |                                 |     |    |    |
| To making the hay, say thirty tons, at      |     |    |    |                                 |     |    |    |
| 12s. per acre                               | 9   | 0  | 0  |                                 |     |    |    |
| To tithe, taxes, &c. say                    | 10  | 0  | 0  |                                 |     |    |    |
|                                             | 139 | 0  | 0  |                                 |     |    |    |
| To profit, interest of money, and the       |     |    |    |                                 |     |    |    |
| decreasing value of cows included           | 113 | 10 | 0  |                                 |     |    |    |
|                                             | 252 | 10 | 0  |                                 |     |    |    |

N. B. A large dairy might be kept for 25s. per cow.

\* At this time (January 1797) cheese of last year's making is worth three pounds per hundred.

† Annals of Agriculture, Vol. XXXII.

‡ Ibid.



at four or five months old, (which in the year 1788 cost about 18s. a piece,) and keep them on skimmed milk for the space of a month, and then sell them at the profit of about 6s. The proportion in which they are kept is about that of one to every three cows in milk; which, as their long-horned Derbyshire breed of cows mostly continue to milk for nine months, will be in the ratio of three pigs to each cow, or eighteen shillings, but at the present prices more than thirty shillings.

*Grazing.*—There are particular situations and kinds of grass land on which this system of management may be had recourse to with much more profit and success than that of dairying. This is mostly the case in all those districts where the extent of arable land is inconsiderable when compared with that which is in the state of pasture, and of course the value of grass-produce but small, in comparison to that of fattened animals. In all the tracts of grass land that are sufficiently fine and rich enough in quality to fatten oxen or other large cattle, this practice may be adopted and carried on with profit and advantage, and is probably the best application of such lands that can be attempted. This indeed is fully shown by most of the rich, fine, marshy, or other tracts of grass land in different parts of the kingdom being almost invariably conducted under some branch of the grazing system.

The success of this practice, like those of most others employed in the art of husbandry, will depend on different circumstances; as the situation and quality of the land, the accuracy of the management in regard to the method of stocking and feeding it; the nicety of the farmer's judgment in adapting the animals in nature, size and quality to its particular condition; and, above all, to his discernment in selecting such stock, of whatever kind it may be, as is perfectly healthy and disposed to fatten, as well as in obtaining it at such price as that it may pay well for the keep bestowed upon it; and in ultimately disposing of it, when brought into proper condition, to the best advantage.

The stocking of grazing lands with a proper kind of animals is probably one of the

The encouragement of the dairy is on the whole strongly recommended, but only on condition that a different sort of management be adopted from that now practised, in respect to the feeding of the cows, which are almost universally depastured in the fields both summer and winter: in consequence of which, the dung produced even by a large dairy is trifling indeed; whence arises a manifest declension in the fertility of the land, and a grazing farm may be distinguished at a great distance from a dairy one. "In this exhausted state (says the author) the dairy land must remain, unless a different system of management be successfully inculcated." It is therefore suggested that all dairy farms should be accompanied with a due proportion of arable, as perhaps a *fourth part*, for the purpose of raising various kinds of crops as winter food, such as have been noticed; and that proper stalls and bartons be erected as a residence for the cows during the winter months, in which they may be soiled with these productions.



most nice and difficult points in the whole range of farming. In the natural state, such animals are in general produced on the lands as are suited to the state and nature of their herbage: thus, in the mountainous districts, where the grass is short and light, the small breeds of both cattle and sheep prevail; while in the low, rich, marshy, or other pastures, where the grass is more full and luxuriant, we have the larger breeds of these different animals. It will therefore be necessary, in this business, for the farmer to consider two things: first, what sort of stock may be the most proper for the particular kind of land on which they are to be grazed; and, in the second place, what sorts may afford the greatest profit in the consumption of the herbage. It will probably in most cases be found, that upon the strong and more dry rich pastures the larger sorts of cattle and sheep will be the most proper, and turn out to the greatest advantage; but that on such as are less dry and luxuriant the different smaller breeds of cattle, as well as sheep, may be found to pay the best. This is in some degree proved by the practice of the graziers in different districts. On the rich lands in Suffex \* and Lincolnshire, as well as other grazing counties, they prefer the large breeds of cattle as well as sheep for the purpose; while in many others that are less fertile, the smaller sorts are found more to the advantage of the grazing farmer. In pastures where the grass is short, sheep are mostly the proper sort of stock.

But besides this circumstance of adapting the stock to the nature and situation of the land, the properties of the breeds must be attended to. Those sorts, whether cattle or sheep, which have the property of keeping themselves fat, or in tolerable condition, with the least expenditure of food, should be constantly preferred, whatever the size or breed may be. It is a quality that has been observed to be of much greater importance to the grazier than that of size, abstractedly considered †.

It has been well observed, that where the grazier has fine and rich pastures, he may "choose his beasts as large as he can find them, provided they are of the right breed and shape; but let him always prefer shape to size; for it will assuredly pay him better." And it is added that "those who are upon indifferent grass must take care to proportion the size of their beasts to the goodness of their pastures; their cattle had much better be too small than too large; there are vast tracts of land that will" answer well in grazing, which are not good enough to support large breeds ‡."

The same thing, probably, holds good in a great measure with respect to sheep.

Where the stock is bred upon the land, there will be little difficulty in fixing

\* Synopsis of Husbandry.

† Annals of Agriculture, Vol. XXXII.

‡ Ibid.



upon such animals as are the most suitable in these different intentions; but as it will frequently be necessary for the farmer to purchase his stock at fairs and other places, much care and attention, as well as knowledge, will be requisite for him to do it in the most advantageous manner. It is of great importance in this business to provide such as have been kept in a proper manner, and are in a healthy, thriving condition; as, where the contrary is the case, they are difficult, and require a much greater length of time, to be brought into the state proper for sale than would otherwise have been necessary. It is perhaps experience alone that can qualify the grazier to form a correct judgment in these respects: in general, however, he is led to the choice of stock by no fixed or scientific principles, but by the impression the appearances of the animals have upon him. It has been observed that the experienced grazier, who has been accustomed to attend fairs and markets, knows at sight, or by the assistance of the slightest touch, whether the animals he is about to purchase will suit him. Their general form and looks please him. They are every where clean; have little offal about them; their eyes are full and vivid; their countenances brisk; their skins alive, and their flesh mellow. On the whole, they have the resemblance of those which have been grazed before with success. Others are rejected, from the grazier not having found any such as they resemble to have done well, but many to have turned out in an unprofitable manner\*.

There are, however, principles in this branch of the farmer's business which may be attended to with great advantage, as the animals have certain points or parts, the proper or improper forms of which denote them to be valuable or the contrary for this purpose. These are, that the legs should be short in proportion to the size of the animal; the back very straight, broad and flat; the loins wide; the carcase deep round, or rather barrel-shaped below; the fore-quarters round, full, and spreading; the bones small; the flesh affording an elastic feel; the skin thin, and a disposition to fatten well, and on the best parts. Where these marks are predominant, the stock is mostly suitable for the purposes of the grazier.

It has likewise been remarked, that where the hair of the hide, in fattening cattle, is inclined to curl instead of being straight, they are most disposed to thrive. This has been found to be the case in practice in different parts of the kingdom†. In lean beasts also, when the hair of the hides is curled, they commonly keep themselves in better condition than where the contrary is the case. In all cases a disposition in the animals, of whatever sort they may be, to wildness, and not remaining quietly in

\* Marshall's Rural Economy of Midland Counties, Vol. I.

† Annals of Agriculture, and Weight's Husbandry in Scotland.



the pastures, forms an insurmountable objection in this system of management; as no animal ever fattens well that has a tendency to ramble: it is quietness, feeding quickly, and lying much, that has the greatest tendency to make them become fat in a short time. From the result of actual experiment with four different beasts, in which the least possible difference could not be discovered on the most minute examination, it has been shown that too much attention cannot be bestowed in the choice of the breed of fattening stock, as, though they were in every respect the same in appearance, two, from their superior disposition to fatten, were found to afford a profit in the proportion of fifteen shillings the week, while the other two did not yield more than about five shillings and tenpence\*.

In different situations different sorts of both cattle and sheep must often be preferred from the ease and convenience of procuring them; but the graziers in the midland districts for the most part find that variety of the long-horned, termed the Craven breed, to answer the best, as having the most advantageous form, and the greatest disposition to fatten readily, especially as improved by Mr. Bakewell. In Lincolnshire some prefer the large short-horned breed, others long-horned, with a mixture of other kinds; as the different sorts of Scotch, and such as are bred in the neighbourhood. In Somersetshire the dark red Devonshire breed is the most prevailing sort, which have also of late been more in demand by the best graziers in Leicestershire, Oxfordshire, and Warwickshire. In the London markets these are said to come next to the Galloway Scots that are fattened by the Norfolk and Suffolk graziers, in the fineness of the grain of their flesh and their internal fatness†. The Cumberland and other North Country graziers mostly employ the home breeds, which are in general of the long-horned kind, with both the Scotch breeds, the Kiloe and Galloway. They find the Kiloes the quickest feeders, the Galloways the next, and their own the slowest‡.

The Herefordshire, Glamorganshire, and Suffolk Polled breeds are all found valuable as grazing stock in different situations§.

The breeds of the particular neighbourhood, as well as cattle of the small Welsh or Scotch kind, may often be the most profitable where the grass lands are not of a rich or fertile nature, as the size of these may be more easily proportioned to the quality or goodness of the lands; and there are scarcely any so indifferent as not to be capable of bringing the smallest to a sufficient state of fatness for the market.

In regard to the descriptions of this sort of stock that may be employed with the

\* Annals of Agriculture, Vol. XIV.

† Billingsley in Somersetshire Report.

‡ Corrected Report of Cumberland and Northumberland.

§ Ibid.



greatest profit by the grazing farmer, they are unquestionably oxen and spayed heifers, the latter in general fattening not only much better, but more expeditiously \*, but are not capable of being procured with such facility; and of the former kind, such as have been accustomed to work are preferred in almost every grazing district, as both fattening more kindly, and making better beef than others that have not been employed in that way †. When killed at a great age, after being kept to work, the beef has been found extremely good ‡. In some cases cows that have become dry, as well as such old cows as are found unfit for other uses, are purchased by the grazier for the purpose of fattening; but the danger of success in these instances is always considerably greater: of course, though they occasionally turn out to much advantage, such as have been mentioned above are constantly to be preferred. Cows, especially those that are of much age, scarcely ever fatten well, and never in a quick manner: they can therefore hardly ever be equally profitable for the uses of the grazier as those of other sort of young stock. Whenever cows are employed for the purpose of grazing, they should constantly be let take the bull either before they are turned into the pastures, or as soon after as possible, and be always in a state fit for the market at least three months before the period of their calving.

In this business, rather young or middle-aged cattle stock are perhaps always to be as much preferred as possible, from their having in general a greater propensity to thrive and become fat. And it is of material consequence, as has been just mentioned, that they are in a good thriving condition when bought in; as when this is the case they become fat with less food, and in a much shorter space of time.

In regard to sheep stock, it is probable that in general the large improved long-woolled breeds may be the most profitable on the more rich and productive pastures; but on those where there is a less degree of fertility, and the grass is shorter, the more small short-woolled improved breeds are preferable for the uses of the grazier. In the first of these cases, that sort which is termed the New Leicester has of late years had numerous advocates, and is, perhaps, when all its properties are considered, to be in *general* preferred to any of the other long-woolled breeds: though, in particular instances of very rich grazing lands, in the view of wool, there are other sorts that may probably be more advantageous. Where wethers are capable of being procured of the New Leicester kind, they mostly turn out an excellent stock for the grazing farmer. In the latter instance the South Downs are in common the most advantageous sort, as not being exceeded, perhaps, by any of

\* Lisle's Husbandry, Vol. II.

† Ibid.

‡ Annals of Agriculture.



the short- or middling-woolled breeds. There are many other breeds of both the long and the short-woolled kinds that may be employed with equal if not greater advantage in particular situations, and under particular circumstances.

In Somersetshire the Polled sheep of the lower part of that district have lately gained ground over those of the Dorsetshire sheep, formerly the prevailing sort by the best grazing farmers. They afford a large shear of wool, fatten quickly, and particularly on the internal parts. They are supposed capable of improvement by crossing with the new Leicester breed \*. The Romney Marsh graziers principally employ the white-faced Polled and the South Down breeds, both of which they find profitable on their lands. The Cumberland graziers chiefly stock with the true black-faced Heath and Cheviot breeds of sheep, the former of which they find the more quick feeders, as well as more hardy †.

It has been observed to be an advantage in the grazing of sheep, to procure them from situations where the lands are less rich than those on which they are to be fattened, as under such circumstances they are found to thrive in a more rapid manner, and, from their bearing the pen or fold with less injury, become fat in a shorter space of time ‡.

In the system of grazing management, many different methods of practice are employed, both in respect to neat cattle and sheep. With some graziers it is a method to purchase their cattle in the fairs in the autumn season, about October or in the following month, supporting them, during the winter, principally with straw, or sometimes, which is a much better practice, with a little hay mixed with it, till towards the beginning of March, continuing their fattening through that and the succeeding month with some sort of succulent food, such as turnips, potatoes, or other similar kinds, until the grass be in a state fit to be turned upon in May, on which they may be carried forward and completed according to circumstances about August, or in the following month.

Another method of management is to purchase the beasts lean, as soon as the grass lands are in a state fit to be turned upon in May, wholly completing their fattening on the grass about the latter end of October, or later in the autumn, according to their quickness in feeding. In this system of practice the smaller sorts of cattle stock may be found in general the most advantageous, especially where the lands are not of the most fertile or luxuriant kind.

The grazier has also sometimes recourse to another mode of proceeding in his

\* Somerset Report.

† Cumberland Report.

‡ Kent's Hints.



system of fattening neat cattle; but which is, we believe, in general less profitable than either of the preceding methods: this is that of buying in his stock at such periods, according to the difference in their sizes, as that they may be ready to be disposed of about April, or in the succeeding month, a period at which they usually fetch a high price. In this system, with large oxen or other sorts of beasts, it is sometimes the practice to keep them through two winters, giving them only one summer's grass; being in the first winter not fully fed, but kept in good grass in the summer season, and forced on with the best feeding in the second; but with the smaller sorts of stock, one summer's grass and a winter's stalling is the usual mode; the cattle being bought in as soon in the spring as the grass is risen to a good bite.

In some districts heifers are preferred to oxen, in which case they buy them in about March or April, and, after keeping them through the summer, sell in October and November. This method is thought by some a profitable system of management. All those methods may probably be practised with advantage under different circumstances; but it is obvious that the first can only be had recourse to with propriety where green winter food is raised in sufficient abundance, and the grazier has a store of litter for being converted into manure. Under other circumstances the second mode of management will be much more profitable. The two last methods are the least convenient, and, probably, on the whole, except in very favourable circumstances, the least profitable, especially the former of them, as, from the great length of time which they are kept, much management and attention to food becomes necessary to render them advantageous; which, with common servants, is seldom sufficiently regarded.

Besides these, there is another practice that deserves attention in particular cases, such as that of buying in small cattle in tolerable condition in the autumn as soon as the after-grass is ready, in order to their being fattened out on the rouens, and disposed of towards the latter end of October or beginning of the following month. This is a practice sometimes beneficially pursued on the rich hay-farms in the county of Middlesex.

With sheep stock different systems of grazing are likewise in use. In some cases, where the lands are in a state of inclosure, it is a profitable practice to buy ewes in lamb in the latter end of summer or beginning of autumn, keeping them on the inferior sorts of grass lands, stubbles, or fallows till the beginning of January, and then by giving them turnips or cabbages to keep them in good condition through the period of their lambing, and afterwards in the best manner that can be contrived, in order that the lambs may become fit for the butcher sufficiently early to



admit of the ewes being afterwards fattened, and disposed of in the beginning of the autumn.

Another method of grazing sheep is to purchase wether flock about the beginning of May at the age of two or three years, keeping them scantily till some weeks after the grounds have been cleared from hay, then bringing them to good keep in the rouen, afterwards fattening them by means of turnips or cabbages so as not to have them ready sooner than the beginning of March, which is usually the season in which they fetch the best price. This is a species of grazing-management that mostly affords a good profit to such farmers as are sufficiently attentive to it.

In addition to these methods, there is another practised in some cases with great profit and advantage, which is that of buying in lambs of the wether or other kinds about the beginning of September. These are kept in different methods by different managers: by some they are brought forward with the greatest possible expedition by the best keep, so as to be ready to be disposed of as soon as possible. Others, however, adopt the contrary method, keeping them only in a middling way during the winter till about the beginning of April, and then forcing them by good keep so as to have them ready for the butcher in August, or continuing them in the following month, and then clearing the whole of the flock from the land. This is a practice from which great profit is often derived\*.

The providing of grass-lamb for the markets as early as possible in the spring months is an object of great importance, and which pays the grazier well in many situations, especially near large towns. In this view it is the practice to procure the more forward ewes, such as those of the Dorset kind, which may drop their lambs in the beginning of January, if not before. In Middlesex, where this management is much attended to in consequence of the great demand, it is the custom to purchase this sort of ewes at Kingston, Weyhill, and other fairs in the neighbourhood. The ewes, in order that they may have a plentiful supply of milk, are extremely well kept on turnips and fine green sweet rouen hay, and the lambs thereby forced forward in such a rapid manner as to be ready for the markets in the beginning of March or April. The ewes, from their becoming dry so early, are capable of being fattened and disposed of towards Michaelmas, usually fetching the prices at which they were purchased in at: as the whole of the flock is in this system cleared

\* Corrected Report of Middlesex,



within the year, the farmer has the opportunity of fully ascertaining its advantage or disadvantage\*. In this management very much depends upon keeping the ewes perfectly well fed, and in dry warm inclosed pastures, as without such attention the ewes are apt to become thin and lean in consequence of the greatness of the evacuation, and afterwards to require a much longer time in being made fat.

In the fattening of grass lambs Mr. Marshall, in his Midland Counties, has mentioned a practice which in particular cases may be advisable; this is that of removing the lambs from the ewes when they decline much in milk, before they are perfectly fattened, in order to complete them on young clover or other sorts of "prime keep." The principle in this case is that of the ewes becoming sooner ready for the butcher: besides, it is supposed by some, that after the first flush of milk is gone and it begins to be scanty, the lambs thrive better "on grass alone away from the ewes" than when kept along with them, as the hankering after the little milk that is afforded prevents their feeding freely on the grass. Where this method is followed, which can probably be with advantage only where the milk of the ewes is *greatly* deficient in supporting and bringing the lambs forward, much attention must be paid to having the keep early and in abundance. In this view rye-grass and white clover for early use, and broad clover at a later period, may be the most proper and, useful crops. In this management the ewes should be carefully examined occasionally; and, where much deficiency in the milk is found, the lambs be immediately removed to the pastures.

The proportion in which different sorts of cattle and sheep stock should be introduced upon the grass lands with the view of being fattened, must depend chiefly upon the goodness of the land, the size of the stock, and various other

\* The account is thus stated by Mr. Middleton, in his Survey of the Agriculture of the County of Middlesex:

|                                            | £. | s. | d. |
|--------------------------------------------|----|----|----|
| Lamb, sold at                              | 1  | 10 | 0  |
| Ewe, do. do.                               | 1  | 10 | 0  |
| Wool, 2s. 6d. or                           | 0  | 2  | 0  |
| Together                                   | 3  | 2  | 0  |
| Deduct prime cost                          | 1  | 12 | 0  |
| Remains the increase of an ewe in one year | 1  | 10 | 0  |



circumstances that have been already noticed\*. In Somersetshire, when at grass on the rich and middling sorts of land, they allow from one acre to an acre and a half to an ox, and some add one sheep to each ox.

The great principle is never to stock in such a way as to restrict the animals in the least degree; as it is by filling themselves quickly, and lying down much, that the greatest progress in fattening is made, whether in cattle, sheep, or any other sort of animals when at grass. On the weaker grass lands a much smaller proportion of stock than on those of the rich and fertile kind can only be admitted. Often not more than an ox and a sheep or two, to two acres or two acres and a half. There is also another circumstance that is necessary to be attended to in bringing the flock properly forward in the pastures, which is that of changing them more frequently than has generally been the case with graziers. On this principle, as well as those of their affording greater degrees of warmth and shelter, and thereby promoting the growth of the herbage more abundantly, small inclosures may be

\* In the able Agricultural Survey of Lincolnshire, Mr. Young, in order to afford a more clear idea of the various proportions, has drawn them into the following tabular form for the richer pastures in that district:

| Places.                             | Sheep in summer per acre. | Acres per bullock in summer, with the sheep. | Sheep in winter per acre. | Rent. |
|-------------------------------------|---------------------------|----------------------------------------------|---------------------------|-------|
| Long Sutton . . . . .               | 5½                        | 2½                                           |                           |       |
| Mr. Scroop . . . . .                | 11                        | No bullocks.                                 |                           |       |
| Boston, &c. . . . .                 | 4                         | 1½                                           | 2                         |       |
| Skirbeck . . . . .                  | 5                         | 1¼                                           | 2                         |       |
| Boston . . . . .                    | 5                         | 1                                            | 3½                        |       |
| Deeping Fen, Mr. Graves . . . . .   | 5                         | 2                                            | 1½                        | 40    |
| Alderchurch, Mr. Berridge . . . . . | 7½                        | 2                                            | 3                         |       |
| Swineshead . . . . .                | 2½                        | 1                                            | 2                         |       |
| Ewerby . . . . .                    | 3                         | 2½                                           | 2                         | 30    |
| Horbling, &c. . . . .               | 3                         | 2                                            | 2                         |       |
| Howel . . . . .                     | 3                         | 3                                            | 2                         |       |
| Immingham . . . . .                 | 1                         | 1½                                           | 2                         |       |
| Grainthorp, &c. . . . .             | 3                         | 3                                            | 1½                        |       |
| Stallenborough . . . . .            | 2                         | 2                                            | 2                         |       |
| Skidbrook . . . . .                 | 1½                        | 1½                                           | ½                         |       |
| Ditto, &c. . . . .                  | 2                         | 2                                            | 2                         | 35    |
| Addlethorpe . . . . .               | 5                         | 1¼                                           | 2                         | 40    |
| Gosberton . . . . .                 | 6                         | 1                                            |                           |       |
| Burgh, &c. . . . .                  | 5                         | 2                                            | 2                         | 40    |
| Wrangle . . . . .                   | 2                         | 2                                            | —                         | 36    |
| Hundred of Skirbeck . . . . .       | 2                         | 1¼                                           | 2½                        | 45    |
| Wibberton . . . . .                 | 5                         | 2                                            | 2                         |       |
| Marth Chapel . . . . .              | 3                         | 2                                            | —                         | 35    |
| Ditto . . . . .                     | 3                         | 1                                            | —                         | 45    |
| Grimby . . . . .                    | 2¾                        | 1                                            | 2¾                        |       |
| Average                             | 3¾                        | 1¾                                           | 2                         |       |



more advantageous in the grazing of live stock than large ones; but to have them varying in size from ten or fifteen to twenty-five acres or more, according to the nature of the pastures, may be the perfection of the system: the matter is not, however, easily decided by experiment, as no two pieces of grass land can scarcely be met with that are precisely equal in all their different circumstances.

In the disposal of the stock after it has been made fit for the butcher, considerable care is necessary to perform it in the most advantageous manner. It has been observed, that though this is a less difficult part of the business of the grazier than that of buying in, it demands much judgment and experience to manage it in the best way\*. Some utility in directing this matter may be derived from a careful attention to the manner of fattening in the animals during the time they are at full grass, and from the consideration of the length of time they have been; but the most correct judgment may probably be formed by the occasional use of the weighing machine, by making accurate comparisons of the living with the dead or profitable weights of different sorts of animals that are sold on the farm; as by this means, after a few trials, a facility in correctly deciding on the dead weights of such parts of the stock as the living weights have been fully ascertained in, may be attained. It is in this way that the butcher has a superiority over the grazier. All the smaller sorts of animals, such as calves, sheep, and hogs, may have their living weights ascertained with great ease and convenience by the simple means of a pair of large *steelyards* being fixed up in any convenient place, and a sort of contrivance for containing them, with doors at the different ends, usually termed a *cage*. The frequent weighing of all sorts of fattening animals may also be beneficial in other ways; it will show with exactness the progress that is made in the feeding of any sort of animals, and the proper periods of disposing of them, as well as any changes that may be necessary in their pasture or other food, and at the same time ascertain the pay of each†. In this business it is mostly, however, the case for the grazier to decide by the eye, and the feel of the animal, but this mode is extremely fallacious, even with those who have had a large experience.

In the mode of disposing of his fat stock, the grazing farmer must be directed by the nature of his farm and the circumstances of his situation. In the southern parts of the island, Smithfield is the principal market; but in the northern parts of the kingdom the several large towns. In the first case, on the smaller sorts of farms, the fattened stock is mostly sent up by men who are solely employed in the business,

\* Marshall's Midland Counties, Vol. I.

† Corrected Report of Somersetshire.



and who are termed district drovers, being regularly employed by different graziers in the same neighbourhood, and in whom they have the most perfect confidence. But where the farms are very extensive, so as to enable the graziers themselves to regularly send droves of cattle or other stock to this market, the common practice is to depend upon salesmen for the disposal of them.

On very small farms, where the lots are not sufficiently large to make it an object to have them brought up in these ways, it may be more profitable to dispose of them to the butchers at home. The advantage of these different markets must depend much upon the particular circumstances of the cases. It has, however, been suggested that amongst the Somersetshire graziers it is a prevailing opinion that the London market, from the great fluctuation in the prices on account of the differences in the supply, is only calculated for those who pay a regular weekly attendance\*. The differences in the expenses, including the salesmen's commissions, are very considerable, as amounting in London to twelve shillings per head, while in the country markets they are not more than from three to five shillings†.

It is evident, from what has been advanced, that the advantage of grazing must be influenced by a variety of circumstances and be very different in different instances and situations; but that in all cases it must very materially depend on the goodness of the system, and the excellence or superiority of management that is practised. It has been observed, in speaking of Romney Marsh grazing, that no regular method can be adopted in that sort of management, and that the profits of no two graziers are perfectly "alike on the same given quantity of land," nor could they be "upon the same land," as years, prices, and abilities differ with each individual‡. It is consequently impossible to give any statements that can be generally applicable§.

\* Corrected Report of Somersetshire.

† Ibid.

‡ Price in Annals of Agriculture, Vol. XXI.

§ In Somersetshire the profit of grazing is thus stated by Mr. Billingsley, after observing that a grazier occupying two hundred acres of land may fat yearly one hundred head of oxen, to which add two hundred and seventy sheep and ten colts, constituting altogether a profit comfortable, but by no means *exorbitant*.

#### GRAZING.

| Dr.                                      | £. s. d. | Cr.                             | £. s. d. |
|------------------------------------------|----------|---------------------------------|----------|
| To rent of 200 acres, average value 40s. |          | Oct. By fifty oxen, at 18l. . . | 900 0 0  |
| an acre . . . . .                        | 400 0 0  | May. By fifty oxen at 13l. . .  | 650 0 0  |
|                                          |          |                                 |          |
| Carry forward                            | 400 0 0  | Carry forward                   | 1550 0 0 |
|                                          | 6 0 2    |                                 |          |



In other districts the profits of this practice appear to much greater advantage\*.

In the Romney Marsh system of grazing, which is chiefly by sheep, the advantages

## GRAZING.

| Dr.                                                        | £.   | s. | d. | Cr.                                                                     | £.   | s. | d. |
|------------------------------------------------------------|------|----|----|-------------------------------------------------------------------------|------|----|----|
| Brought forward                                            | 400  | 0  | 0  | Brought forward                                                         | 1550 | 0  | 0  |
| To tithe and taxes, say                                    | 50   | 0  | 0  | By profit on seventy sheep, summer kept                                 | 40   | 0  | 0  |
| Feb. To fifty oxen, at 11l.                                | 550  | 0  | 0  | By profit on ten colts                                                  | 40   | 0  | 0  |
| July. To fifty oxen, at 7l.                                | 350  | 0  | 0  | By profit on two hundred sheep winter fatted, and sold in April unthorn | 100  | 0  | 0  |
| To mowing and making fifty acres of hay, at 10s.           | 25   | 0  | 0  |                                                                         |      |    |    |
| To skinning and making fifty acres of summer-leaze, at 3s. | 7    | 10 | 0  |                                                                         |      |    |    |
| To wages throughout the year, besides the farmer's labour  | 50   | 0  | 0  |                                                                         |      |    |    |
| To accidents                                               | 20   | 0  | 0  |                                                                         |      |    |    |
|                                                            | 1452 | 10 | 0  |                                                                         | 1730 | 0  | 0  |
| To profit (interest of capital and accidents included)     | 277  | 10 | 0  |                                                                         |      |    |    |
|                                                            | 1730 | 0  | 0  |                                                                         |      |    |    |

\* In Lincolnshire, on the authority of T. Fydell, Esq. the following account is given by Mr. Young of the profits of grazing the rich lands:—

## GRAZING ACCOUNT for 20 Acres, 1796.

| Dr.                                         | £.  | s. | d. | Cr.                        | £.  | s. | d. |
|---------------------------------------------|-----|----|----|----------------------------|-----|----|----|
| To 18 beasts, at 12l. each                  | 216 | 0  | 0  | By 18 beasts, at 19l. 5s.  | 346 | 10 | 0  |
| To 80 sheep, at 46s.                        | 184 | 0  | 0  | By 80 sheep, at 55s.       | 220 | 0  | 0  |
| To Expenses viz.                            | 400 | 0  | 0  | By 52 tod of wool, at 17s. | 44  | 4  | 0  |
| Tithe                                       | 1   | 10 | 0  |                            | 610 | 14 | 0  |
| Dyke-reeve                                  | 3   | 0  | 0  |                            |     |    |    |
| Rates                                       | 10  | 0  | 0  |                            |     |    |    |
| Shepherding                                 | 3   | 0  | 0  |                            |     |    |    |
| Expenses                                    | 5   | 0  | 0  |                            |     |    |    |
|                                             | 22  | 10 | 0  |                            |     |    |    |
| Loss, supposed one sheep                    | 2   | 6  | 0  |                            |     |    |    |
|                                             | 424 | 16 | 0  |                            |     |    |    |
| Interest one year                           | 21  | 4  | 0  |                            |     |    |    |
| One year's rent                             | 60  | 0  | 0  |                            |     |    |    |
|                                             | 506 | 0  | 0  |                            |     |    |    |
| Hire of a close for the winter for 35 sheep | 17  | 10 | 0  |                            |     |    |    |
|                                             | 523 | 10 | 0  |                            |     |    |    |
| Profit                                      | 87  | 4  | 0  |                            |     |    |    |
|                                             | 610 | 14 | 0  |                            |     |    |    |

It is added that the difference between the buying and selling price, loss deducted, 208l. 8s., is the



are stated in the following way by Mr. Price\* ; but in considering them proper additions are to be made for the advances that have taken place since they were drawn up. They in some measure show the system that is pursued in these rich marshes.

In some cases the young horses may be grazed upon the coarser sorts of pastures with advantage ; but in general, except under the breeding system, it will be more profitable to keep them on green food cut fresh as it is wanted during the summer season : the benefit in the way of manure is very great in this method. Some advise the grazing of young horses in the same pastures with the fattening stock, in order that the grass may be more evenly fed down ; but this is probably a mistake ; and as they are very apt to disturb and drive the cattle about, it may be a better practice to let them follow the feeding stock, or be put into a separate pasture. The superiority of eating down grass lands by sheep in comparison to horses was found very remarkable by Mr. Young, in Lincolnshire. In Somersetshire, where any horses are admitted on the grazing grounds, it is very sparingly, not more than in the proportion of one to twenty acres†.

It has long been a practice to turn hogs upon pieces of grass land adjoining the produce of the land, or 10l. 8s. per acre, which is very great indeed, and shows that this land would let at 5l. 4s. an acre, *supposing this year to be an average one*. This difference of rent would deduct 44l. from the profit of 87l. and leave 43l. ; which, with 21l. charged, makes 64l. interest on the year's advance of 546l. or 11½ per cent.

\* *An Account of Stock bought in for Fifty Acres of Pasture Land, for the Year 1778.*

*Stock sold off Fifty Acres of Pasture Land, in the Year 1788-89.*

|                                  | £.  | s. | d. |                                                     | £.   | s. | d. |
|----------------------------------|-----|----|----|-----------------------------------------------------|------|----|----|
| 310 barren ewes, at 1l. 1s. each | 325 | 10 | 0  | 310 barren ewes, at 3 1s. each                      | 480  | 10 | 0  |
| 90 South Down wethers, at do.    | 94  | 10 | 0  | 90 South Down wethers, at do.                       | 139  | 10 | 0  |
| 10 steer runts                   | 98  | 15 | 0  | 10 steer runts, at 13l. each                        | 130  | 0  | 0  |
| 10 Suffex oxen                   | 115 | 0  | 0  | 10 Suffex oxen, at 15l. each                        | 150  | 0  | 0  |
| 8 steer runts                    | 49  | 10 | 0  | 10 ditto, to keep 18 weeks, at 2s. per week each    | 18   | 0  | 0  |
| Rent, at 30s. per acre           | 75  | 0  | 0  | 8 steer runts, sold at 9l. each                     | 72   | 0  | 0  |
| Expenses, at 5s. per acre        | 12  | 10 | 0  | 2 ditto, to keep 12 weeks, at 1s. 6d. per week each | 1    | 16 | 0  |
|                                  | 770 | 15 | 0  | 8 packs 3 draughts of long wool, at 8l. 10s.        | 74   | 7  | 6  |
|                                  |     |    |    | 1½ ditto of fine wool, at 12l.                      | 18   | 0  | 0  |
|                                  |     |    |    | Total                                               | 1084 | 3  | 6  |
|                                  |     |    |    | Deduct                                              | 770  | 15 | 0  |
|                                  |     |    |    | Clear profit                                        | 313  | 8  | 6  |

† Billingsley's Agricultural Survey.



farm yards during the summer season; but this has mostly been done without any distinction of their kinds or ages. But the improved practice is to separate those that are advanced in their growth to one half or more from the sows and young pigs, turning and confining them about the latter end of May on the clover,

*Profits on Fattening Land, allowing 10s. Profit for each Sheep:*

| ONE ACRE.                            |  | £.    | s. | d. |
|--------------------------------------|--|-------|----|----|
| Winter, 2 barren ewes, off in May    |  | 1     | 0  | 0  |
| Summer, 5 wethers, off at Michaelmas |  | 2     | 10 | 0  |
| Wool of 7 sheep, at 12l. per pack    |  | 2     | 2  | 0  |
| One bullock to fat                   |  | 3     | 0  | 0  |
|                                      |  | <hr/> |    |    |
|                                      |  | £.    | s. | d. |
| Rent                                 |  | 1     | 10 | 0  |
| Expenses                             |  | 0     | 5  | 0  |
| Assesses and taxes                   |  | 0     | 5  | 0  |
|                                      |  | <hr/> |    |    |
|                                      |  | 2     | 0  | 0  |
|                                      |  | <hr/> |    |    |
| Clear profit                         |  | 6     | 12 | 0  |

| ONE ACRE.                       |  | £.    | s. | d. |
|---------------------------------|--|-------|----|----|
| Three wethers, on at Michaelmas |  | 1     | 10 | 0  |
| Two ditto, in May               |  | 1     | 0  | 0  |
| Wool                            |  | 1     | 10 | 0  |
| One bullock to fat              |  | 3     | 0  | 0  |
|                                 |  | <hr/> |    |    |
|                                 |  | 7     | 0  | 0  |

|                     | £.    | s. | d. |
|---------------------|-------|----|----|
| Brought from bottom | 7     | 0  | 0  |
| Rent, &c. as before | 2     | 0  | 0  |
|                     | <hr/> |    |    |
| Clear profit        | 5     | 0  | 0  |

*Profits on Breeding Land\*.*

| ONE ACRE.                            |  | £.    | s. | d. |
|--------------------------------------|--|-------|----|----|
| Winter, 2½ ewes and 3 lambs, at 14s. |  | 2     | 2  | 0  |
| Wool of 2½ ewes                      |  | 0     | 13 | 0  |
| Wool of 3 lambs                      |  | 0     | 4  | 0  |
| Wool of one teg                      |  | 0     | 4  | 0  |
| The summer improvement of do.        |  | 0     | 5  | 0  |
| Joint bullock keep                   |  | 0     | 10 | 0  |
|                                      |  | <hr/> |    |    |
|                                      |  | 3     | 18 | 6  |
| Rent                                 |  | 1     | 0  | 0  |
| Expenses                             |  | 0     | 5  | 0  |
| One in twenty loss by deaths         |  | 0     | 7  | 0  |
|                                      |  | <hr/> |    |    |
|                                      |  | 1     | 12 | 0  |
|                                      |  | <hr/> |    |    |
| Clear profit                         |  | 2     | 6  | 6  |

On the first of these statements it is remarked that the year was favourable for vegetation; and that such profits could not probably be made seven years together, which is the most accurate method of calculating profits on land. There being no assesses on the land also makes it more profitable.

In regard to the profits on fattening land two methods are given; the first means used by the best graziers; the other, the most common: some take bullocks in to keep, others buy runts; the profits of which must depend on their judgment; but 3l. is the *medium* profit between the whole: 10s. each sheep is generally allowed as the gained profit by fattening. The writer observes, that "it cannot be supposed that this profit will always amount to so much, as the years differ; therefore dry seasons will abate it, and a large tract of land cannot have the supply of flock to make it so great. There are losses to be taken out; but, upon the whole, it is *very* profitable, as the expenses are so *moderate*, as one servant man can manage a thousand acres of pasture land. The value or rent of land is put too low, except for long leases unexpired, or where a large quantity of land is taken. The average price of rent is from 40s. to 3l. for fattening land, unless four or five hundred acres of breeding and fattening, perhaps about 30s.; and some old leases 1l. breeding land."

There are other modes of grazing in which the same author has formed estimates; but they must vary so much by circumstances as to be of little use.

\* Inferior breeding land maintains 2½ sheep on an acre during winter, but good breeding land always three.



chicory, or other similar crops, without suffering them to return to the yards to be fed with other sorts of food, water being provided for them in the fields.—They are let remain on these pastures till the beginning of the autumn, when they are found to return in excellent condition for being put to fatten. Herbage of these kinds is found not only to agree perfectly with them, but to promote their growth in a remarkable manner. But, much as this system of management has by some been extolled, there seems to be one principal defect in it, which is that of the loss of the manure, a circumstance of great importance to the farmer. The practice would, therefore, probably be improved by having the yards connected with the pastures, and well littered down, or, where on an extensive scale, cheap temporary yards made for the purpose and kept in litter for them to retire to and evacuate themselves in during the night by being shut up in them. In this way vast stores of manure would be produced, which must otherwise be in a great measure lost, and at the same time the thriving of the hogs be promoted by their being kept more warm and sheltered in the night. By this management the farmer has great advantage, in being left at full liberty to convert the whole of his other sorts of food to the support of the young and breeding stocks. But, profitable as this practice may be, it would seem to be less so than that of soiling them in properly-prepared yards, especially where they are left in the fields without being confined during the night.

*Soiling and Stall-feeding.*—Besides the above, there are other systems of feeding and fattening animals that seem properly to come under consideration in this place, such as those of *soiling* during the summer season with various kinds of luxuriant green vegetable crops, and *stall-feeding* in the winter months with roots, cabbages, turnips, and other sorts of food of a succulent nature, in combination with various kinds of dry meat. The former of these modes appears to have had much less attention bestowed upon it than its utility and importance would seem to demand. Without attending sufficiently to the economy and advantage of the practice, it has been the common husbandry in almost every part of the island to allow all sorts of neat cattle to be grazed in the pastures. In some cases of improved farming it has indeed been lately pursued in some degree in the stable, but without being applied to the cattle stock. The principal circumstances that recommend this system of practice, are those of the food being consumed with much less waste, and of course going vastly further than when fed upon the land; the great increase of good manure that is produced, and probably that of the stock feeding with less interruption and inconvenience, in consequence of their being more effectually shaded from the heat of the sun and better protected from the harassing attack of flies. In all these



points, this method would indeed seem to have a vast superiority over that of letting the animals range over the pastures. It has, however, been objected against this scheme of feeding, that the expense of conducting the business is too considerable. The experiments of Mr. Mure, which were conducted upon a very extensive scale, as well as those of Mr. Young, show that this with the care of the cattle may be performed at an expense in proportion to each, that can never afford any solid argument against the practice\*. It has likewise been sometimes contended, in opposition to this management, that such part of the stock as are in milk do not afford it so abundantly as when fed in the pastures. This is, however, probably a mere supposition, unsupported by facts; at least we have not met with any well-conducted experiment that has proved its truth, and it is obviously at variance with the experience we have of the effects of such sorts of green food, in other cases; for it has been, we believe, almost invariably found, that most of the green crops that are cut and employed in this way have greater effect in exciting the secretory organs and promoting their secretions than the common pasture grass. And it is generally allowed that the urinary secretion is greatly augmented in all cases of this sort of feeding, so as to constitute one of its advantages. But as particular sorts of vegetables, as well as other substances, act more powerfully on some of the glandular organs than others, it is evident that some kinds of plants may have a greater tendency to promote one kind of secretion than another, and on this account cows fed on one sort of food, in the practice of soiling, may afford less milk than on another †.

The practice of soiling has also been opposed, on the ground that the animals do not thrive so well as when grazed in the pastures. But when it is considered that the more quiet and free from disturbance cattle are kept, the better they in general thrive and improve in their flesh, it is not probable that green food, when properly consumed in the sheds of a farm-yard, will be less advantageous in promoting the growth and fattening of stock than when eaten in the field, where exposed to the great heat and the constant attacks of flies, and of course kept in a continual state of restlessness and inquietude. Besides, in the experiments noticed above, the cattle were found to go on better than stock of the same kind fed in the pastures in the most favourable seasons for the purpose of grazing. And in many trials, carefully made by Mr. Young, and detailed in the *Annals of Agriculture*, the results were the same. The supposition of the cattle not thriving so well under this system does

\* *Annals of Agriculture*, Vol. XIV.

† A set of well-conducted experiments made in these different views would probably lead to much useful discovery in respect to the feeding, fattening, and milking of animals.



not therefore appear to be well supported by facts, or to have had any foundation in the experience of farmers.

The superiority of the soiling method in respect to the economical consumption of the food cannot be disputed. In various experiments that have been made in proof of the great saving in this way, it has been found to go from twice to four or five times as far as when fed on the land; and in some trials it has been a great deal more. With grass, clover, lucern, and tares, in the trials of an able cultivator, three times as many cattle were found capable of being supported in better condition than in the pasture mode of feeding\*. But in those of other experimenters it has been shown to be equal to five, six, or even more times, as we have already seen in speaking of clover. In the field, it is obvious that great waste must be committed by the grass being trampled down, dunged upon, and in many other ways, especially where a great number of cattle are pastured together, most of which are avoided in the stall method: but it has been remarked that it is "an error to suppose that all the waste is in feeding in the field and none in the stalls: there is on the contrary a waste in soiling," as in cases where the tares become podded, from the butt ends of the plants being coarse and in a state of decay, by lying on the ground, and of course rejected by the animals: the same thing also occurs with lucern when in blossom. In the heating of the food by its remaining heaped together, loss may likewise be sustained†. Proper management in respect to the crops and the manner of employing them, as we shall see below, will, however, in a great measure, prevent waste in this method.

But whatever the waste in these different ways may be, the various trials recorded in the *Annals of Agriculture* clearly demonstrate that a vastly increased stock may be kept upon the same extent of land in the method of soiling, over that of the common mode of grazing the cattle in the fields.

The great point however, in which this practice excels that of pasture feeding, is, probably, in the immense quantity of excellent manure that is raised and provided for the production of increased crops of various kinds, and the additional improvement of the lands; while in the ordinary one scarcely any thing is contributed in this way, from the dung being scattered about the fields and dissipated by the heat of the season, flies, and other causes. In short, it would seem injurious rather than

\* Close in Communications to the Board, Vol. III.

† *Annals of Agriculture*, Vol. XIV.



useful, from its blanching and tendering the grass plants in the spots where it remains, which are long in recovering and producing good grass again. Soiling with green food in summer is a method admirably calculated for producing an abundance of manure; as from the great increase in the urinary discharges in the consumption of green food in this way, and the heat of the season, the littering material, whatever it may be, is speedily converted into manure; by which means, with proper attention, vast stores of dung may consequently be raised, where there would otherwise be none; which is a circumstance of the greatest importance, and which abundantly shows the great utility and superiority of the practice. By these means the summer produce in manure may, probably, be made to exceed that of the winter, and at the same time be superior in quality, as there is reason to suppose, that the manure produced by any kind of cattle fed in the same way, when not in a state of fattening, is much better in the summer than in the winter season. The proportion of valuable manure that the careful farmer may be capable of providing by this system of management is scarcely to be conceived, except by those who have been in the practice. In this view it is of much importance to have reservoirs for the reception of the urine, in order that it may be occasionally thrown up over the litter, and thereby promote its more speedy conversion into manure. The manure afforded by fattening animals, such as hogs and neat cattle, is in all seasons of a rich and valuable quality.

In order to ensure the fullest benefit and advantage from this system of management, the most strict attention is necessary to different circumstances; such as those of having convenient sheds and yards for the purpose; the providing suitable crops in proper succession to the proportion of stock to be kept; the feeding and managing the animals in a proper manner; and the making a full provision of materials for the purpose of litter.

As much depends on the convenience of the yards and sheds, both in respect to the economy of labour in feeding the stock and the making of manure, care should be taken to have them upon such plans as may afford the greatest advantage in these ways. It has been a practice suggested by some, in order to save the labour and expense of cleaning and feeding, to have the cattle in this management left loose in the yards so as to consume the food from racks or cribs, the bottoms of the yards being prepared by marl or other similar materials, and a coat of litter applied, so as that the urine may be retained, and contribute to the conversion of them into manure:



but a better method is probably that of having them tied up in stalls in sheds for the purpose; for though something may be gained in the former mode in the labour of cleaning, the latter has considerable superiority in the goodness of the manure, and in the animals being kept more quiet and less exposed to disturbance from flies\*. In the first method the stock should always be sorted, and those of the same age or size be fed together. A cultivator of much experience soils his horses in cheap thatched sheds in which they have room to walk and roll; and his bullocks and cows in stalls seven feet wide, each stall holding two head of cattle, which are fastened by the necks to the sides of the stall, by which they are prevented from inconveniencing each other†.

That the farmer may enter upon this management with the greatest advantage, it will be requisite for him to attend to the culture of such various crops as can be best applied in this way, on a scale amply sufficient for the purpose. In the view of early application, a full proportion of lucern should be raised on the most deep and fertile soils; and on the better sorts of the lands that may be in the condition of fallow, clover and tare crops may be grown. These must be sown so as to come into use at different times; the first crop of winter tares succeeding to the early cut lucern; the later put in winter tares following, after which the clover will most probably be ready, to which the third crop of tares and the second cut of lucern may succeed. At a still later period the spring tare may be employed; and in succession to this the third cutting of lucern will in general be ready. There are many other plants that may perhaps be made use of in this way. It will be seen from what we have observed on chicory, that it may be had recourse to with advantage in this management; as in soils that are tolerably fertile it admits of repeated cutting. With these different crops, there will probably be seldom any necessity for the use of common cut grass, though this may be employed if there should be occasion.

On the mode of conducting the business of foddering the animals in this practice a great deal depends. One great object is never to suffer them to have too much at once, as when this is the case, from the heat of the season, it quickly takes on a degree of fermentation, and is rejected, or only picked among by the cattle; in consequence of which much waste may be committed, which would otherwise be avoided‡. But, besides this, it is not improbable but that the stock may thrive better by having their food more frequently, and of course in a more fresh state.

\* *Annals of Agriculture*, Vol. XIV.

† *Close in Communications to the Board*, &c. Vol. III.

‡ *Annals of Agriculture*, Vol. XIV.



And it should never on any account be left packed in the carts for any length of time. The best mode would seem to be that of adapting the size of the cart to the exact consumption of the flock, as in this way the whole may be conveniently distributed in the cribs or racks at once, the moment it is wanted, before it becomes unpalatable by fermentation, and the least possible loss be incurred. It is constantly necessary to watch the conduct of labourers in this particular, as they are in general much disposed to overfeed. There is another matter in this sort of feeding that should not be disregarded, which is that of not suffering the crops that are used in soiling to advance to too great a head, as by attention in this respect the food may be more cleanly eaten up.

In this system litter becomes an object of the greatest importance; as the large quantity of urine that is made by cattle when soiled on these luxuriant sorts of green food is capable, by its moistening property, of aiding, in the hot season, the more quick fermentation of such materials, and of reducing a very large proportion into the state of manure. In this view, the attentive farmer should therefore make an abundant provision in the winter time of other sorts of materials, where a proper supply of straw cannot be reserved for the purpose. There are various matters that may be made use of in this intention, such as stubble, fern, rushes, and other aquatic plants, which may be cut and raked together in the places in which they are most abundantly produced, in order to be stacked up for future use. Leaves might also in woody situations be useful for the same purpose. And in addition to these vegetable matters there are other substances that are capable of being employed with utility, such as peat or bog earth, fresh vegetable mould, sand, and the scrapings of roads; as during the decomposition of the various vegetable materials made use of in this practice, not only much hydrogen and carbonic gas is set at liberty, but ammonia is formed in large quantities in the manner that has been already explained, which, from its action upon such earthy materials, is highly useful in bringing them into the state of manure.

There can scarcely be any doubt of the advantage of this mode of management, where that close sort of attention which is requisite in most of the operations of farming is bestowed: but in order to the complete success of the practice, it is absolutely necessary that the cattle be kept perfectly clean and free from all sorts of dirt, in the cribs, racks, or other places; that there be plenty of pure water for them to drink whenever they are disposed; that the green food, of whatever sort it may be, is given to them frequently in due portions, without its becoming injured by



keeping; and that they be turned out into the open air for a few hours in the cool of the evening during the summer season, and in the middle of the day when the weather becomes more cold. It might also be of additional advantage, where different kinds of green food can be easily provided, to vary them occasionally. By these means the thriving of the animals may be the most effectually secured.

This kind of management is equally applicable to cattle, hogs, and horses; with the last it has however been the most common.

It is obvious, that by a judicious attention to this system many advantages may be derived to the farmer. It admits of greater extents of land being kept under both the plough and the scythe. And in the keeping of both cows and horses the saving in this method forms an object of vast importance.

In the winter fattening of animals, different methods are pursued in different districts: in some it is the prevailing practice to consume the food upon a dry sound piece of land, to which it is conveyed for the purpose. It is evident, however, that this mode can only be had recourse to, especially with heavy stock, where the nature of the ground is sufficiently dry to prevent injury being done by poaching, which is the case only on very few soils in the winter season. In some cases, especially with turnips, the crop is eaten on the land where it grows, the cattle being turned upon it. This is a practice that occasionally takes place in Norfolk with the less perfect managers. It is a great objection to this mode, that the quantity of valuable manure that might otherwise be produced is in a great measure lost by being spread about in the field. And it is probable that the stock does not thrive so well from being more exposed to the weather and kept less warm and quiet than in other methods. With sheep this husbandry may be less exceptionable, especially where the crops are drawn and put upon a close fed dry pasture, as great improvement of the land may be effected without the danger of injury by poaching.

There is another practice often adopted in fattening cattle in the winter, which is that of confining them to the yard, and letting them have their food in troughs or boxes for the purpose in open sheds. This, though a better method than that just noticed, is probably, from the stock being left too much at liberty, less advantageous in the point of fattening than that of wholly confining them to the stalls, or what is usually termed *stall-feeding*, as by this means they are kept more quiet, and free from interruption, and of course feed more quickly, and with greater regularity; which seem to be points of great importance in this system of management.



The substances that may be employed in the way of winter fattening animals are very numerous; but the principal of the more succulent kinds are carrots, parsnips, potatoes, cabbages, turnips, grains, &c.; and of the more dry sorts, oil-cake, oats, barley-meal, rye-flower, bean-meal, and other similar materials, with various sorts of straw cut into chaff by means of machinery. In the application and management of these articles, considerable care is necessary to ensure their fullest effect. For as the art of fattening, whatever the nature of the animal may be, would seem to depend in a great degree on regularly keeping up the excitement of the system, by the use of suitable rich food, to that high pitch that tends towards indirect debility, which is probably the point most suitable for inducing rest and a disposition to sleep, which experience has shown to be the conditions the most favourable to the deposition of the fatty material in the cells of the adipose membrane; it is obvious that the fattening process may be greatly accelerated or retarded by the method of distribution that is adopted in respect to the food. If much nice attention be not bestowed in this way, great loss may be quickly sustained, especially where the more expensive sorts of dry food are made use of. On the same principle of promoting the full and equal excitement of the system, it will be of the greatest utility and importance not only to keep the animals warm, perfectly clean in themselves, and free from all kinds of filth; but also their sheds, stalls, mangers, troughs, or other places from which they take their food; as by such means that constriction of the hide which is the sure indication of their not thriving in a proper manner, may be avoided, and at the same time that disgust, which probably arises in consequence of the parts of the food left upon the places where the cattle feed taking on or running into a state of fermentation, be prevented; and of course, the feeding of the animals proceed in the most expeditious and uninterrupted manner. And where both moist and dry food are given at the same time, it may be necessary, in the view of promoting the more quick fattening of the cattle, to combine them in such proportions, according to the constitutions of the animals, as that the too laxative effects of the former may be kept in order by the constipating powers of the latter; and thus a due balance be preserved, which is the state most adapted to the purpose of fattening. But besides this effect, the combining of dry food with those rich and juicy substances, which have their nourishment in a close or concentrated state, may be advantageous in another point of view, which is that of affording a due degree of distention to the stomach, a condition that is also probably necessary to the expeditious fattening of animals. Without



this, that sort of fulness or satiety which induces the animals to take their rest cannot, perhaps, be so completely produced. It is on this principle, that in man a full meal cannot be made on flesh meat alone without the assistance of bread, or some other similar substance. On this ground, hay or cut dry meat must therefore be constantly useful in stall feeding, with such rich roots and plants as are not capable of being employed so as to produce the necessary degree of fulness.

In order to accomplish these different objects in the most perfect and effectual manner, it is essential that the closest attention be bestowed by the farmer to see that the stock, whether foddered in open sheds or tied up in stalls, be regularly fed, adapting the proportion of food employed each time to the state of the digestive organs of the animal; cautiously avoiding, as much as the nature of the business will admit, either giving too much or too little, as from both extremes injury may be produced: but it is better, as fattening animals are very nice, to let them have rather too little than too much; for, where any disgust is occasioned, they never feed so well afterwards. It is useful also, on the principle formerly explained, to vary the kinds of food frequently, so that there may be less danger of their losing their beneficial effects. This circumstance is much attended to in other countries: fattening stock that is neglected in these respects never succeed well, or afford the farmer a just profit. It is consequently of vast importance to have this business conducted by a person accustomed to the practice. The cattle should likewise be kept constantly free from standing in any sort of dirt, by having the dung daily removed, and their standings swept out quite clean, and well littered down with dry clean litter of some of the kinds that have been already recommended, so as to prevent any sort of nastiness from adhering to their skins.

To do this completely, as much should be made use of as can be converted into manure, probably the proportion of from one to two or three tons to a beast may not be too much, as the dung will amply repay its expense in the improvement which it affords to the lands. And by this, with the above means, all sorts of disgusting smells may be wholly removed. It is also useful in the intention of fattening to have the animals sheltered and kept in a due degree of warmth, without being too hot; as, where the heat is considerable, there may be disadvantage by too much perspiration being excited. Where it is necessary to make use of cut dry meat, the best practice is probably that of keeping some of such food always in the cribs or mangers, so that the animals may be induced to take it at pleasure.



The business of fattening in the stall, or the farm-yard, usually commences on the decline of the pasture and after-grasses, towards the latter end of October, continuing through the whole of the winter, until about the beginning of May. When succulent food is made use of with cut dry meat, which is in general a more profitable method to the farmer than that of having recourse to corn and oil-cake, carrots, parsnips, and potatoes would seem to stand the highest as articles for this purpose; cabbages and turnips having been found inferior in their fattening qualities; the two first are equal to almost any sort of food in this view, being capable of fattening large cattle. The most general practice is to use these roots and plants without any preparation, except that of being sometimes cut, sliced, or chopped, giving only a small proportion at once, three or four times in the course of the day, in cribs or mangers properly contrived for the purpose; proper supplies of cut straw in mixture with hay being in most cases provided and given in the intervals of such feeds. In this method less water will be required than when dry meat is wholly made use of. This mode of feeding must be pursued with as much steadiness and regularity as possible, varying the kinds of moist food occasionally where it can be conveniently done. A great deal of the success of the practice rests upon proper attention to these circumstances. Some have supposed that great advantage may be derived from the application of fire in the preparation of some of these roots for the feeding of the animals. In the trials of an intelligent cultivator\*, turnips were found to answer well in the feeding of cows in combination with cut chaff when prepared by means of steam; and in various experiments, detailed in the *Annals of Agriculture*, potatoes have been found to be better suited to the feeding of horses and some other animals by undergoing the same process†. This mode of preparation is probably much more necessary in the potatoe than the turnip, as we believe, from trials that we have made, that they not only agree better with the animals, but are more fattening when given in this state. Besides, there is much less loss sustained in the operation of steaming in the potatoe than the turnip. However, as there must constantly under this mode of preparation be a considerable expense in labour and fuel, it is better to avoid it wherever the nature of the vegetables will admit of being made use of in their raw state, which is certainly the case with the turnip and several other vegetables noticed above.

\* Rev. Mr. H. Close.

† An excellent *apparatus* for this purpose, contrived by Mr. Stares, is described and represented by a plate in the Eighteenth Volume of the *Annals of Agriculture*.



The proportions of these different sorts of food that an animal will consume in any given time cannot be easily ascertained, as much must depend on circumstances—the modes of feeding, the size of the animal, the nature of the season, and various other causes.

In some trials carrots have been found to be consumed in the proportion of about ten stone per day for an ox of sixty stone, cut chaff or hay being given in addition\*. As the parsnip contains an equal if not larger proportion of the nutritious principle, nearly a similar quantity of that excellent root may be necessary; but we believe experiment has not yet shown the exact difference in the fattening properties of these two roots. The latter can however only be cultivated to advantage on a deep rich soil; but in such cases it should never be neglected. An acre of either of these roots would complete the fattening of two such beasts as the above, if taken from the pastures in a half-fattened condition. These two roots and the potatoe, probably, approach the nearest that of oil-cake in their fattening properties, but are certainly inferior to that substance.

The experiments made on potatoes in the intention of fattening animals have been sufficiently numerous to show that they are capable of that application with great advantage. In the trials of Mr. Abdey, with small Welsh and Scotch runts, the consumption per day was about a bushel each, given in their unprepared state, with a quarter of a truss of hay. Their powers of fattening in these trials appear to much advantage. When given in their raw state, hay or some other sort of dry food is, however, constantly necessary to correct their laxative quality. And when given after being prepared by fire, it is the practice of many to mix them with cut chaff.

Where the cabbage is made use of, the consumption is in general found to be something less than one-fifth the weight of the animal in the course of the day; therefore an animal weighing sixty stone consumes in the ratio of twelve stone each day. In the trials of Mr. Turner, an ox of eighty stone was found to eat fifteen stone of cabbages with half a stone of hay. And in respect to their power of fattening, it was found that oxen put to them in low condition about November became in a state of fatness fit for sale in the following March, weighing eighty stone; usually improving in the course of four months in value about five pounds ten shillings†. In this proportion, an acre of thirty tons of this crop would be adequate to the fattening of three beasts of the above size.

\* Annals of Agriculture, Vol. XXXII.

† Turner in Young's Six Months Tour, Vol. II.



Grains can only be made use of in this way in particular situations, as near large towns, where they can be obtained at a reasonable rate. Those procured from distilleries are found the most beneficial in this use. The quantity made use of for moderate-sized beasts is usually from a bushel to a bushel and a half, three times in the course of the day, hay or cut dry food being given between the periods of feeding with these substances. Grains seem to be much less powerful in their fattening properties than any of those articles that precede them.

But turnips, though very frequently employed in this manner, are greatly inferior to cabbages, as, besides their being more liable to injury, they probably possess the fattening property in a less degree than any of the substances that have been mentioned. The proportion in which they are consumed by the fattening animals has by some been found to be something more than a-third of their weight, but by others about a third in the day \*. In other experiments, an ox of from seventy to eighty stone has been ascertained to eat something less than three hundred weight in the course of the day, besides chaff and hay; and small cows of about thirty stone, one hundred weight and three quarters in the same space of time. An experienced agricultor has found, that when consumed in stalls or sheds, an acre of good turnips will “completely winter-fat an ox of fifty score,” besides affording manure for an acre and a half of land; but if fed upon the land, two acres will not fatten one so well, and the dressing will be partial and of little value †. Much dry food is constantly necessary during the use of this sort of food in order to the expeditious fattening of the animals.

The turnip is often employed in the fattening of sheep; and in this application it is frequently advantageous, where the management is conducted with judgment: but to derive the greatest profit from this practice, it is probably the best method to only make use of them for such sheep as are in a considerable state of forwardness; as such as are poor when turned to this sort of food are seldom found to pay well for it. Every farmer who has applied turnip crops in this way must have found this to be the case. Where the soils are sufficiently dry, the best method of consuming them may be on the lands, by means of hurdling; but, under the contrary circumstances, they may be drawn and eaten upon a dry piece of sward. It is the practice with good farmers, in many cases, to have recourse to oil-cake, oats, barley-meal,

\* Baker's Experiments and Kames's Gentleman Farmer.

† Close in Communications to the Board, Vol. III.



pollard, bran, malt-dust, and other matters of the same sort for the fattening sheep when at turnips; as by these means the watery quality of that food is corrected, and the fattening of the animals, of course, much promoted. It is perhaps only the best sort of sheep that can repay the expense of this system of fattening. These articles are not however absolutely requisite in the fattening of sheep on this root, as vast numbers are made fat without them; but they greatly promote the process. And it is often useful to have recourse to other sorts of dry food with them, such as hay, cut chaff, or other similar substances, which should be placed in racks, cribs, or troughs made for the purpose, the latter of which should be so guarded by boarding as to prevent the wind from blowing such light substances out of them. There is another point that deserves attention in the fattening of sheep on turnips, in order to prevent the waste which must otherwise be incurred, which is that of letting the portions of turnips that are left by the fattening flock be cleanly eaten up by lean followers.

Of the dry kinds of food employed in the fattening of cattle, there is, perhaps, none equal to *oil-cake* in the property of fattening. It is, however, linseed-cake that must be employed in this way. The late advances in the price of this article have probably rendered it incapable of being made use of with much profit except in particular cases, and where manure is a principal object. With this sort of food, as well as those that have been noticed above, it is also the common practice to give some other sort of meat, such as hay, cut chaff, and other substances of the same nature. In this mode of fattening, some begin by giving, to a beast of a hundred stone, two cakes per day, of about six pounds each, for six or eight weeks, and then increase them to three, till the animals become fat\*. In addition to the cake, from half a stone to a stone of hay is given each day: the whole consumption in cake being about 21 cwt., and in hay 26 cwt.; which, at the prices previous to the late advance on these articles, rendered the expense of winter-fattening an animal of the above size something more than seven guineas. Lean cattle of the smaller kinds have been made perfectly fat in the course of eight or ten weeks by this substance, in the trials of Mr. Moody†. The cake, in this application, is broken down into small parts, and frequently blended with the chaff or other substances that are made use of with it. On the continent, according to Mr. Young, linseed-cake is sometimes exhibited in a liquid state, being diffused in hot water and drunk by the cattle, hay and other substances being given at the same time. In the Lincolnshire Report a method is suggested,

\* Annals of Agriculture, Vol. XXXII.

† Young's Eastern Tour, Vol. I.



of giving cake to cattle while in the pastures, in a small proportion, with great success; a practice which may be applicable where the cake-fed beasts are not fully fattened for sale in the early spring months. It is an advantage in fattening with this and other similar substances, that the animals may be completed with them at much more advanced ages than in other modes.

The use of linseed-oil and bran has been attempted on the same principle as that of cake, but probably with less success. The consumption in this method for beasts of the smaller size is something more than half a peck of bran three times in the day, with a third of a pint of linseed-oil well stirred into it; with this good hay or cut chaff is usually given. This method is attended with more trouble than that of cake-feeding, without any superiority in the effect. It can only be employed when the oil is cheap.

When sheep are fattened with cake, they require it to be reduced into a much finer state than for beasts, and it may then be mixed with bran or other similar substances, and put in the troughs or cribs.

Oats are excellent for stall-fattening cattle, but the price has lately been too high for their being made use of to any extent in this way. They are mostly given in the straw when applied in the fattening of cattle.

Bran, in mixture with pea or other sorts of meal, had likewise been found useful in stall-fattening, as well as barley and other meals, in combination with various substances of other kinds; but their use must constantly be regulated by the prices which they bear at the market. When materials of this sort are employed, it will be found particularly necessary, on the principles that have been already explained, to let the animals have a plentiful supply of hay or cut chaff.

It has long been contended by some, that food in the state of acidity is the most advantageous in the feeding and fattening of swine, while others have as strenuously maintained the contrary position. The point has not, however, so far as we know, been fully decided by any fair experiments. That there may be something in it, seems probable from the circumstance being so frequently noticed, and from Mr. Young having found the same principle applied in the fattening of cattle in France, where they finish the process by the use of sour rye paste, brought into a liquid state by the addition of water, and afterwards rendered sufficiently thick by some kind of cut meat. The principle on which this depends seems involved in some difficulty; as it has been long a popular notion, that acids have a directly contrary tendency. It would appear, however, not



improbable, but that acid substances may have some power in strengthening the digestive organs, and thereby promoting the consumption of a larger proportion of food in a given time, in consequence of which the animals become fat more quickly.

Besides these substances, various others have been employed in particular situations for the purpose of fattening animals. The wash of malt-distilleries, which has long been principally employed in the fattening of hogs, has now been found applicable in the stall-feeding of cattle. The method of using it is in conjunction with some farinaceous substances, such as those that have been already mentioned. It is then given in small proportions, three or more times in the day : a little hay or straw being given them to enable them to chew the cud\*. On the principles explained above it is probable, however, that such dry kinds of food might be made use of more fully with advantage. In the West Indies, Mr. Millington found molasses to possess an expeditious fattening quality, when joined with other articles of the common food of cattle. It was made use of in his trials in the proportion of from half a pint to a pint, twice a day, in mixture with different farinaceous or mealy substances; and, where these were not in use, with various kinds of dry food, such as cane-tops, and guinea grass well dried by exposure to the sun, and with oil-cake. These are moistened with the same quantity of molasses, to which water with a little salt is added†. With these articles a little hay, or not too succulent green fodder, was employed. Their effects in fattening poor worn down oxen were found very considerable. They are not, however, from their great expense, capable of any general application in this way.

Whatever the nature of the food may be that is employed for the purpose of fattening animals in the yard or the stall, the greatest care is necessary to see that it is regularly given to them, that they have it in due proportion and sufficiently varied; that pure water be amply provided, and that they have litter so as to keep them perfectly dry and clean. Where this sort of business is conducted on an extensive scale, it is also of the greatest utility to have a machine for the occasional weighing of the cattle as they advance in their fattening, as without such assistance it is but few persons who are capable of judging whether they go on in a profitable manner or not. But, by weighing them from time to time, at the distance of every eight or ten days, in the morning before they are fed, this may be correctly ascertained; and where they fall off, or do not advance in a sufficient degree to the preceding weighings,

\* Middlesex Corrected Report.

† Ibid.



such changes may be made in their food, water, and management, as are the most likely to promote their fattening in the most perfect manner\*.

There is another scheme of feeding that may be necessary to be considered in this place, which is that of fattening lambs in the house for the purpose of early

\* The following table exhibits the results of various experiments made by Mr. Mure in fattening cattle with different sorts of food, in the stall and field, as stated in the 19th volume of the Annals of Agriculture.

| No. & Sort of Bullocks. | When weighed. | Weight. | Sort of Food.                   | Time fed. |       | In-crease | Increase per Head. |
|-------------------------|---------------|---------|---------------------------------|-----------|-------|-----------|--------------------|
|                         |               |         |                                 | Wks.      | Days. | Stns.     | St. lbs.           |
| 19 Irish                | June          | 24 1650 |                                 |           |       |           |                    |
|                         | July          | 12 1729 | Tares                           | 2         | 4     | 79        | 4 2                |
|                         |               | 29 1748 | Mowed grass                     | 2         | 3     | 19        | 1 0                |
|                         | August        | 29 1781 | Ditto                           | 4         | 3     | 33        | 1 10               |
| 1 ditto                 | August        | 30 96   |                                 |           |       |           |                    |
| 10 ditto                | January       | 5 1024  | Cabbages and hay                | 17        | —     | 113       | 6 6                |
| 8 ditto                 |               | 9 774   |                                 |           |       |           |                    |
|                         |               | 1894    |                                 |           |       |           |                    |
| 12 Irish                | August        | 22 829  |                                 |           |       |           |                    |
| 1 bull                  |               | 90      |                                 |           |       |           |                    |
| 12 Irish                | January       | 30 983  | Grass and cabbages              | 24        | —     | 154       | 12 11              |
| 1 bull                  |               | 98      | Ditto                           | 24        | —     | 8         | 8 0                |
| 30 Irish                | July          | 3 2146  |                                 |           |       |           |                    |
|                         |               | 31 2243 | Tares                           | 4         | —     | 97        | 3 3                |
|                         | September     | 27 2329 | Grass and cabbages              | 7         | 6     | 86        | 2 12               |
|                         | November      | 22 2466 | Hay and cabbages                | 8         | —     | 137       | 4 7                |
|                         | February      | 27 2721 | Potatoes, malted beans, and hay | 11        | —     | 255       | 8 7                |
| 7 Highland Scots        | July          | 5 470   |                                 |           |       |           |                    |
|                         |               | 27 468  | Tares                           | 12        | —     |           |                    |
| 3 home breds            | July          | 5 174   |                                 |           |       |           |                    |
|                         | September     | 27 175  | Ditto                           | 12        | —     | 1         |                    |
| 40 Scotch runts         |               | 23 3320 |                                 |           |       |           |                    |
|                         | November      | 7 3537  | Loose at grass                  | 6         | —     | 217       | 4 7                |
|                         | February      | 20 3801 | Potatoes, beans, chaff, and hay | 16        | —     | 264       | 6 8                |
| 10 home breds           | July          | 11 333  |                                 |           |       |           |                    |
|                         | September     | 28 401  | Loose in clover                 | 11        | —     | 68        | 6 11½              |
| 24 short-horn beasts    |               | 19 2522 |                                 |           |       |           |                    |
|                         | October       | 24 2695 | Loose at grass                  | 5         | —     | 168       | 7 0                |
|                         | March         | 16 3057 | Potatoes, beans, and chaff      | 20        | —     | 362       | 15 2               |
| 1 bull                  | September     | 4 140   | Ditto                           | 24        | —     | 48        | 48 0               |
| 2 bulls                 |               | 12 165  | Ditto                           | 21        | —     | 60        | 30 0               |
| 2 bulls                 |               | 19 153  | Ditto                           | 20        | —     | 28        | 14 0               |
| 4 bulls                 |               | 22 312  | Ditto                           | 20        | —     | 60        | 15 0               |



sale. This is a practice which can only be undertaken with advantage in situations at no great distance from large towns, where there is great demand for early lamb.

In these trials various other kinds of food were employed, the results of which show the quantity consumed, their different advantages, and the difference in the increase of flesh in the animals in proportion to their value.

| No. of Bullocks. | Weight. | Quantity of Food consumed (Length of Time 63 Days). | Value of Food. | Increase. |
|------------------|---------|-----------------------------------------------------|----------------|-----------|
|                  | Stones. |                                                     | l. s. d.       | Stones.   |
| 1,               | 59      | 4½ coombs steeped bean meal, . . .                  | 2 4 4½         | 8         |
| 2,               | 59      | 3 coombs 3 bushels malted beans, . . .              | 1 17 6         | 11        |
| 3,               | 59      | 5 coombs 1 bushel malted barley, . . .              | 2 11 0         | 14        |
| 4,               | 61      | 5 coombs ¼ bushel malted beans and barley, . . .    | 2 2 10         | 13½       |
| 5,               | 62      | 4 coombs 3½ bushels steeped barley-meal, . . .      | 2 8 9          | 13        |
| 6,               | 65      | 4 coombs 3 bushels dry barley-meal, . . .           | 2 7 6          | 12        |
| 7,               | 66      | 4 coombs dry bean-meal . . .                        | 2 1 3          | 14        |
| 8,               | 72      | As many turnips as were valued at . . .             | 1 1 0          | 11½       |
| 9,               | 76      | As many potatoes as were valued at . . .            | 1 11 6         | 11½       |
| 10,              | 88      | 4 coombs ½ bushel malted beans and chaff, . . .     | 2 6 6          | 15        |
| 11,              | 88      | 4½ coombs malted barley and chaff, . . .            | 2 12 1         | 13½       |
| 12,              | 89      | 4 coombs malted beans and chaff, . . .              | 1 19 4         | 14        |
| 13,              | 92      | malted beans and potatoes, . . .                    | 1 0 3          | 12        |
| 14,              | 128½    | malted beans and potatoes, . . .                    | 1 11 1         | 19½       |

Average increase 13 stones each bullock in 63 days.

N.B. The beans and barley valued at 2s. 6d. per bushel, and the potatoes at 6d. per bushel.

In the following table the quantity of different sorts of green crops per acre is shown, and the proportion of stock they will support:

|                                                                                          | tons. | cwt. | qrs. | lbs. |                     | qrs. | lbs. |
|------------------------------------------------------------------------------------------|-------|------|------|------|---------------------|------|------|
| Weight of scarcity root from 1 acre,                                                     | 19    | 8    | 3    | 20   | Weight of 1 bushel, | 2    | 1    |
| turnips, . . .                                                                           | 16    | 14   | 3    | 18   | . . .               | 1    | 20   |
| potatoes, . . .                                                                          | 10    | 3    | 2    | 8    | . . .               | 2    | 4    |
| cabbages, . . .                                                                          | 14    | 3    | 2    | 8    | . . .               | 1    | 16   |
| Quantity of beans from an acre 8 coombs,                                                 |       |      |      |      |                     |      |      |
| Expense of 1 acre of cabbages,                                                           | £.    | s.   | d.   |      |                     |      |      |
| potatoes,                                                                                | 1     | 7    | 6    |      |                     |      |      |
| turnips,                                                                                 | 0     | 6    | 6    |      |                     |      |      |
| beans,                                                                                   | 0     | 8    | 6    |      |                     |      |      |
| 1 acre of scarcity root will keep a middling-sized bullock 254 days, at 3 bush. per day. |       |      |      |      |                     |      |      |
| turnips, . . .                                                                           |       |      |      | 172  | 4 ditto.            |      |      |
| potatoes, . . .                                                                          |       |      |      | 190  | 2 ditto.            |      |      |
| cabbages, . . .                                                                          |       |      |      | 180  | 4 ditto.            |      |      |
| beans, . . .                                                                             |       |      |      | 105  | 2½ ditto.           |      |      |

1 s. worth of cut chaff per week with this food.

N. B. It appears that an acre of beans, cut green and given stalk and all, exceeds the dry beans 28 days.

—One acre of grass cut green will keep a middling-sized bullock 112 days, supposing 1-ton 6 cwt. per acre.—Three bullocks ate 35 rods of green beans in 12 days. The remainder of the crop was 12 coombs 2 bushels per acre; therefore an acre of green beans will keep one bullock 164 days.



In order to conduct this sort of fattening with profit and success, a *lamb-house* or *suckle* of proper dimensions must be provided. It is found from practice that a range of building from sixty to seventy feet in length, and fifteen or eighteen in

With scarcity root against potatoes the results were as below:—

| Food Scarcity Root.                                                                                                                                               |                                     |              | Food Potatoes.                                                                                                                                            |                                     |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------|
| Time.                                                                                                                                                             | Number, Kind, and Weight of Beasts. | Stones. lbs. | Time.                                                                                                                                                     | Number, Kind, and Weight of Beasts. | Stones. lbs. |
| Jan. 17.                                                                                                                                                          | 8 short-horns weighed               | 963 0        | Jan. 17.                                                                                                                                                  | 8 short-horns weighed               | 955 0        |
|                                                                                                                                                                   | average                             | 120 5        |                                                                                                                                                           | average                             | 119 5        |
| Feb. 28.                                                                                                                                                          | weighed again                       | 1014 0       | Feb. 28.                                                                                                                                                  | weighed again                       | 1010 0       |
|                                                                                                                                                                   | average                             | 126 10       |                                                                                                                                                           | average                             | 126 3        |
|                                                                                                                                                                   | Gain in 6 weeks                     | 6 5          |                                                                                                                                                           | Gain in 6 weeks                     | 6 12         |
| Quantity of food consumed per week by each beast:—One peck three-quarters of beans, and four bushels of cut chaff 1s. 8d., and fourteen bushels of scarcity root. |                                     |              | Quantity of food consumed per week by each beast:—One peck three-quarters of beans, and four bushels of cut chaff 1s. 8d., and eight bushels of potatoes. |                                     |              |

The proportions between the living and dead weights in animals are interesting to the grazier.

### CATTLE.

|                          | Stones. lbs. |             | Stones. lbs. |
|--------------------------|--------------|-------------|--------------|
| Irish bullock killed     | 92 0         | Dead weight | 48 1         |
| March 21, 1789.          |              | Hide        | 6 10         |
|                          |              | Tallow      | 3 7          |
| Highland Scot, killed    | 81 0         | Dead weight | 44 0         |
| Nov. 23, 1790.           |              | Tallow      | 4 8          |
|                          |              | Hide        | 5 4          |
| Home bred heifer, killed | 67 0         | Dead weight | 35 13        |
| March 26, 1791.          |              | Hide        | 4 4          |
|                          |              | Tallow      | 3 7          |
| An ox killed             | 103 0        | Dead weight | 64 10        |
| April 1790.              |              | Hide        | 6 10         |
|                          |              | Tallow      | 6 13         |

### SHEEP.

|                         |      |             |         |
|-------------------------|------|-------------|---------|
| Norfolk sheep killed    | 10 4 | Dead weight | 5 8     |
| April 1790.             |      |             |         |
| South Down sheep killed | 14 5 | Dead weight | 7 3 1/2 |
|                         |      | Tallow      | 0 7 1/2 |
| Ditto killed            | 14 2 | Dead weight | 7 2     |
| Jan. 5, 1791.           |      | Tallow      | 0 7     |



breadth, with three or more coops or divisions of different sizes at each of the ends, for separating the lambs according to their ages, is sufficient for containing and conducting the business of from one hundred and sixty to one hundred and eighty lambs. That the lambs may be enabled to find their mothers with facility, the ewes, when they are separated from them, should be kept apart by deal hurdles in the middle of the house, so that they may be convenient for the lambs in the coops at the ends\*.

After these arrangements have been made, a suitable breed of ewes for the purpose should be provided. The most early ewes of the Dorsetshire breed are the most proper for this management. And there is another circumstance that demands some attention in this system of fattening, which is that of having such ewes as produce lambs that die of a fine white colour in the flesh, or what the butchers term *fair*.

The ewes, after being provided with due attention to these circumstances, are to be carefully kept during the day-time in a warm pasture, and housed in the night. They should be fed with brewers' grains and good green rouen hay, where there is not plenty of grass, as it is of much consequence to keep them well before the time of lambing as well as afterwards. They usually begin to lamb a little before Michaelmas, and when twenty or thirty lambs are dropped they may be put into and confined in the house. And in order to their feeding in the most perfect and expeditious manner, it is necessary that the house be kept constantly well littered with clean wheat-straw. All the dirt and nastiness that may arise or adhere to the coops, hurdles, or other parts, should be often carefully removed and washed away, as without care in this respect the lambs never thrive well. It is likewise necessary to provide a proper supply of calcined chalk, both in the lump and in powder, in order that by licking it they may correct the superabundant acidity of the stomach, and thereby prevent the tendency to looseness, and preserve themselves in health. And as they are apt to suck any thing that comes in their way, a little clean wheat-straw should be put, with the ear ends downwards, in a rack within their reach, for them to nibble and eat of. If there be pitch-marks on the ewes, they should also be clipped out. The foot-rot and scab are likewise to be well guarded against.

The method of management that is usually adopted in the *suckling-house* is this:

“The mothers of the lambs are turned every night at eight o'clock into the lamb-house to their offspring.—At six o'clock in the morning these mothers are

\* Middlesex Corrected Agricultural Report.



separated from their lambs and turned into the pastures; and at eight o'clock such ewes as have lost their own lambs, and those ewes whose lambs are sold, are brought in and held by the head till the lambs by turns suck them clean: they are then turned into the pasture; and at twelve o'clock the mothers of the lambs are driven from the pastures into the lamb-house for an hour, in the course of which time each lamb is suckled by its mother. At four o'clock all the ewes that have not lambs of their own are again brought to the lamb-house, and held for the lambs to suck; and at eight the mothers of the lambs are brought to them for the night.

“ If an ewe gives more milk than its lamb will suck, the superabundance is given to the twins, or to any other lamb whose mother may not be able to furnish it with sufficient food. The shepherd must in this case hold the ewe, or she would not suffer the strange lamb to suck. From their timid nature, it is extremely essential that they should be kept free from every species of unnecessary disturbance\*.”

In order to enable the ewes to support the great exhaustion of this system of management, they are kept plentifully supplied with different sorts of green food, such as turnips, cole, rye, tares, clover, and other similar vegetables, and when these are not capable of being provided in plenty, brewers' grains are given in their place in troughs, and a proper supply of fresh green rye hay in racks. This is requisite not only for the support of the ewes, but that a full supply of milk may be provided for the lambs and the danger of their being checked in their thriving avoided, as where the contrary is the case no sort of feeding can afterwards bring them into a fattening state†.

The lambs are retained in the houses, under this method of feeding, till they are in a proper condition for the butcher; at which time such as are about eight weeks old and fully fattened are drawn out for the market, which in general fetch from two to four or five guineas a-piece, according as they are more early. December and the two succeeding months are the dearest, as at other seasons they seldom fetch more than one half the price. It has been observed that the salesmen and butchers in London find that such lambs as have sharp *barbs* on the inside of their lips die of a deep colour, and those whose *barbs* are naturally *blunt* certainly turn out *fair* meat‡.

The chief objects in this sort of fattening are those of attending to the regular feeding of the ewes, the varying of their food with propriety, and keeping the house perfectly clean and sweet.

\* Middlesex Corrected Agricultural Report.

† Ibid.

‡ Ibid.



*Planting.*—This is a practice which has lately been much more attended to than probably at any former period: the profit and advantage of covering different sorts of land with trees of the fruit, timber, or other kinds, according to circumstances, having begun to be better understood, and of course to gain a greater interest with those extensive proprietors who have the best means of carrying such plans into execution.

It is obvious that on the drier sorts of deep, friable, strong, loamy, and many other sorts of soil, in particular situations, fruit-trees of different descriptions, but particularly the apple and pear, may frequently be planted, when either in the state of tillage or pasture, with great profit and success. And that in the less deep lands, of the same kind, with dry rock subsoils, other sorts of fruit-trees may often be raised with advantage: while on the steep unproductive waste lands, that can neither be cultivated with much benefit under the system of corn or grass, trees of the timber or other sorts admit of being planted with very considerable profit; often from two or three, to eight or ten times the amount which they would afford under any other method of management.

It has been well observed, that waste and barren lands, in most situations, may very conveniently be improved by planting trees on them. There are few spots which would not admit of being brought into culture in this way, under particular circumstances; and there are innumerable tracts, of vast extent, on which it would be much more profitable to the owner to plant with trees, than to attempt any other mode of improvement. “Wherever the soil is dry and infertile; or where its chief or only produce is heath; or where it is full of rocks and stones rising to the surface; or if it be a stiff obdurate clay, having little surface-produce; and in general, in most cases where the soil is poor, if not in the very near vicinity of a town, it may be converted into plantations, if it can be freed from hurtful water, with greater profit than any other improvement it could admit of, unless in very particular circumstances, even where it may admit of being brought, *in time*, into cultivated ground. Where the surface-produce is naturally small, perhaps nothing could be so economical as, *in the mean while*, to fill it with trees; because these, if judiciously chosen, not only yield a greater profit than could be drawn from any other kind of produce, and afford conveniences for houses, and other accommodations for inhabitants and for manufactures, but the ground itself, while the trees continue to grow upon it, undergoes for the most part a gradual amelioration which it would not have done in its natural state, and admits of being more easily improved when the proprietor can find leisure to undertake it, than it otherwise would



have done\*.” Others recommend that every inch of such barren waste lands as are not capable of cultivation by the plough†, or of being usefully applied in the state of sward, should be converted to the purpose of raising plantations, especially those bleak and exposed tracts on the sides of mountains and on the banks of the sea. It is however the advice of an attentive observer, that large plantations or coppices for profit should not be made on good land, always of much more value for corn or pasturage, but either on moist land of small value, upon a clay or marl bottom, where timber often grows well, or rather where such land abounds, upon precipices, and sides of hills impracticable to the plough; and where it often happens the land unplanted is of little or no value‡.”

There are likewise situations in the more warm and less exposed parts of almost every district which are proper for admitting this sort of improvement, on account of their incapability of being converted to other uses; such as the narrow corners of fields in the state of tillage, and the hedge-rows of those in the condition of grass.

In short, there is scarcely any portions of land so poor, barren, rocky, or unproductive, as not to admit of this sort of improvement, provided trees adapted to the nature of their soils and proper modes of planting be practised.

The limits of a work of this nature are, however, too confined to admit of fully examining and entering into the subject, which would fill a volume. It is only a few of the most useful practical directions that can be here brought to the notice of those proprietors who have a wish to render their estates more ornamental and valuable, by the practice of planting those parts of them that do not admit of other modes of culture§. In order to render this sort of management more clear and satisfactory, we shall consider it as applicable in the cultivation of fruit-trees, timber, and coppice, or underwood.

*Fruit-Trees.*---The planting of trees for the purpose of producing fruits of different kinds, in many districts, forms a considerable part of the profit of the farmer. This is the case in Herefordshire, Devonshire, and other counties where

\* Anderson's Essays, Vol. III. † Nicol's Practical Planter. ‡ Pit in Staffordshire Report.

§ As a proof of the great improvement that may be accomplished in this way, it is observed by Mr. Pontey, in his useful Tract on Planting, that an estate of a thousand acres of mountainous land, usually termed barren from the bleakness of its situation, let for not more than twelve shillings per acre, would cost at thirty years' purchase eighteen thousand pounds. If the purchaser expend a thousand pounds more in planting and fencing a hundred acres, so situated as ultimately to screen the whole, allowing compound interest for that with the accumulating rent of the land for fourteen years, the estate



the business of making cider is carried on in an extensive manner; and in the county of Kent fruit-trees are often planted with the intention of deriving profit from the produce.

In those districts where cider constitutes a principal object of the farmer, the planting of apple trees becomes a business of great importance, and requires particular care, in order to keep up a constant succession and afford proper supplies of fruit for the purpose\*.

It is only in those sorts of soil that are of the more dry kind that trees of this would then have cost about twenty-one thousand two hundred pounds; and the account for it, with fourteen years beyond that period, may be stated as under:

|                                                                                | £.     |
|--------------------------------------------------------------------------------|--------|
| Paid for the estate                                                            | 18,000 |
| 900 acres improved by shelter, 3s. per acre, at 30 years' purchase             | 4,050  |
| Value of 200,000 trees (chiefly larch) at 6d.                                  | 5,000  |
| Estate worth at the end of 14 years                                            | 27,050 |
| Cost, as before mentioned, about                                               | 21,200 |
| Improvement by planting                                                        | 5,850  |
| Do. by trees, in 14 years more, at 1s. each                                    | 10,000 |
|                                                                                | 15,850 |
| Deduct for rent of 100 acres, at 6ol. per annum, with compound interest, about | 1,175  |
| Estate improved by planting, in 28 years                                       | 14,675 |

It is added, that in forming "these calculations full allowance has been made for the exposure of situation, as it is not uncommon to see larch worth as much money in half the time, but probably if the whole were suffered to remain to the end of the term, the improvement might not be so great; yet if the thinning were properly attended to, the value of standing trees, with the produce of such as were sold, could not be less than the stated average, independent of expense, viz. 1s. 6d. per tree, or 12 5l. per acre."

\* Mr. Marshall mentions the styre apple, the Hagloe crab, the golden pippin, old red-streak, woodcock, must, Paris or royal wilding, dymmock red, coccagee, ruffet, and Bromley foxwhelp, as still in use.

The sorts of apples that have in practice been found the most proper and valuable for the making of good fruit-liquor in the different districts, according to Mr Crocker, are the following:—

"In Herefordshire and Worcestershire:—The Bennet apple; streaked with red, of a pleasant taste, makes a good second-rate cider.—Captain Nurse's kernel; yellow, streaked with red, of a mild acid flavour, makes light pleasant cider.—Elton's yellow: of this apple there are two sorts, the one to be met with above Hereford and the other below; the former of the shape and size of an orange, yellow on one side and red on the other, of a mild pleasant acid, and makes very good cider: the latter is somewhat larger, and of a beautiful gold colour, sharp to the taste, and makes excellent cider.—Normandy apple: under



description can be raised with advantage. It has likewise been remarked, by an intelligent cultivator, on an extensive scale, that the fruit-liquors of Herefordshire have “always been supposed to derive their excellence from some

this name there are three sorts; the yellow, the white, and the green; all of a bitter-sweet taste, which make rich cider, and of a high colour: the trees are said to be most abundant bearers. Mr. Crocker has been informed by a friend, whose veracity may be depended on, that thirty trees of this sort, in the fifth year after grafting, produced five hogheads of cider, of one hundred and ten gallons each.—Yellow or forest styre; small, red on one side, and a fine yellow on the other; of a mild pleasant acid, and, in the opinion of many, makes a most excellent cider: the tree, however, seldom thrives well, and is but a shy bearer.”

In Somersetshire:—“The Jersey; small, of a light red ground, with a variety of lake-coloured streaks, moderately bitter; makes high-coloured cider, which is sluggish in its fermentation, and ought to be made by itself.—White-Sour; small, of a yellow ground, lightly tinged towards the nose with a light brown, and some strong touches of brown near the stem; of an acid flavour, somewhat acrid, very juicy, and makes smart palatable cider.—Margill; middle-sized, yellow lightly tinged with red, pleasant flavour, is a fine cider-fruit.—Vallis apple; large and handsome, finely tinged with red all over, sweet in its flavour, very juicy, makes tolerable cider.—Barn’s-Door; moderate size, brown towards the stem, the rest red, some red streaks within, late in ripening; a pleasant acid; makes very good cider.—Crab red-streak; small, greenish yellow on one side, light red on the other, with strong red streaks, of a pungent acid, and under proper management makes smart stout cider.—Du-ann; small, yellow near the stem, strongly tinged with red towards the nose, smart acid, makes good cider.—Jack Every; middle size, light yellow tinged with brown and red, sweet flavour, makes tolerable cider.—Cocagee; yellow, spotted with red and brown, of a rough acrid flavour, makes very smart cider under due management; but its fermentation being particularly volatile, it requires much attention soon after making.—Clark’s Primo; middle size, of an orange colour on one side, red blotched with brown on the other, of a mild luscious acid; makes rich cider, and is also an excellent apple for the table.—Buckland; small yellow tinged with red, veined with red within, makes good cider.—Pit-Crab; small, dark red finely tinged with a lake colour within, smart acid; makes good cider.—Slatter’s Pearmain; middle size, yellow, richly tinged with red and brown, delicious flavour, firm flesh, makes excellent cider, but hitherto has been more used at the table than at the press. Slatter’s No. 19; long in its form, ground a yellow and light red, finely blotched with strong red, moderately acrid; is a fine cider-fruit.—Slatter’s No. 20; yellowish ground tinged with red, smart acid flavour, makes very good cider.—Slatter’s No. 21; tinged on the sun-side with red and brown, very pleasant flavour, and will undoubtedly be esteemed as one of our best cider-apples.—The four last-named apples, the author says, are new, the trees being lately raised from kernels by Mr. Slatter of Ilminster, Somerset, whose orchards and cider have long acquired much celebrity.—Castle-pippin; greenish yellow, veined with brown and slightly tinged with red, mild acid, and makes good second-rate pale cider.—Saw-pit; red throughout, acid flavour, and by some is esteemed the best cider-apple in the country.—Pomme apis; large, yellow, faintly tinged with red on the sun-side, broad at the stem, very juicy, smart but pleasant acid, is undoubtedly a fine cider-fruit: it is, however, very little known in this country, having been brought from France but a few years since, and the propagation of it confined to one or two nurseries only.”



peculiar quality in the soil which produces them ; but that a preference has been given to soils of opposite kinds by the planters of different ages. Those of the last century uniformly contended in favour of a light sandy loam, and on that their finest ciders were made : at present, a soil of a diametrically opposite quality, a strong red clay is generally preferred. Much of the soil which is there called clay is properly argillaceous marl ; and some of it contains a large portion of calcareous earth, and effervesces strongly with acids. He has found this soil to form the substratum of some orchards much celebrated for producing ciders of the first quality. It appears to have the effect of mitigating the harshness of rough austere fruits ; and that, as the trees grow with great luxuriance in it, it is, perhaps, of all soils the best calculated to answer the wishes of the planter ; but that the strongest and most highly flavoured liquor which has hitherto been obtained from the apple is

In Devonshire :—Staverton red-streak ; whitish-yellow at the stem, brown tinged with red towards the upper end, pungent acid, makes a smart but pale-coloured cider ; the tree a remarkably plentiful bearer.—Sweet broady ; large and handsome, colour brown and red, makes good cider, useful for mellowing that of the very acid fruits ; the tree large and fine, and bears plentifully.—Lemon bitter-sweet ; yellow rind, hard and firm, a pleasant bitter, and is by some esteemed a fine cider-apple.—Jofey ; a handsome yellow, subject to spots of brown on the rind, of a mild acid taste, very soon after gathering perfects the saccharine fermentation, makes mild pleasant cider but not lasting ; it is also a good table fruit.—Orcheton pippin ; a very handsome apple, yellow on one side and red on the other, of a highly pleasant flavour, excellent for cider, the table, and the kitchen ; in point of general utility perhaps few apples are superior.—Wine-apple ; greenish-yellow ground, very thickly streaked with red all over, pulp a little red, mild acid, is a very good cider-fruit.—Marygold spice-apple ; yellow ground, light brown about the stem, highly and beautifully tinged with pink, mild acid, of a spicy relish, makes excellent cider of a delicious flavour ; it is a delicate fruit also for the table, and keeps long.—Ludbrook red-streak ; yellow ground finely tinged with pink, smart acid, and makes excellent cider : the tree subject to canker.—Green Cornish ; yellow with green ground lightly tinged with red, of a mild acid flavour, early ripe, and makes good cider.—Butter-box ; yellowish-green tinged with light red, mild acid, makes pleasant but not lasting cider.—Red Cornish ; red nearly all over, of a mild acid, makes good cider.—Broad-nosed pippin ; large, rich yellow, mild acid, makes pleasant but not strong cider.—Cat's-head ; large, greenish yellow, pleasant acid, makes good cider.—Brandy apple ; middling size, white, smart acid, makes pale-coloured frisky cider.—Pine's red-streak ; very handsome, red all over except at the stem, flavour not so smart as the Ludbrook, but a cider equally good.—Winter-red ; dark-red with some tinges of brown at the stem, crisp in its pulp, very juicy, of a smart spicy flavour ; will keep until April, and is excellent both for cider and the table.—Sweet pomme-roi : yellowish-green on the shade-side, and brown tinged with red on the sun-side, of a luscious flavour ; is deemed a good cider-apple.—Bickley red-streak ; a late fruit, greenish and yellow finely tinged with red, pulp firm, flavour somewhat acrid, is a most excellent cider-apple."

The sorts of pears that are in most estimation are the Squash, the Oldfield, Borland, Red Pear and Sack.



produced by a soil which differs from any of those that have been mentioned—the shallow loam on a lime-stone basis\*.” There can be no doubt but that the apple-tree is capable of succeeding in soils of very different qualities, provided they be perfectly free from stagnant moisture; but we have found from many trials that in stiff retentive soils, where the bottom is wet, they begin to grow mossy and decline in the course of a few years. It has been found that the early fruits obtain their greatest perfection in a sandy soil, and the late ones answer best when they are planted in a strong loamy or clayey one: the more valuable fruits, as the styre, hagloe crab, and golden pippin delight most in the light sandy soils. And it is a fact fully determined, that cuttings from the same tree grafted upon similar stocks, but planted in different soils, produce different liquors. It is also admitted that liquors of the strongest body, and which keep best, are produced from trees grown in clayey soils†.

Pears are much less particular in respect to the nature of the soil on which they are planted than apples, as they are found to succeed and afford fruit in almost every sort of land‡.

The nature of the situation and aspect that is most favourable and proper for the apple is likewise equally involved in difficulty: some contending for high, others low situations, as well as for different aspects. The intelligent writer just mentioned, however, observes, that “the apple-tree succeeds best in situations which are neither high nor remarkably low. In the former its blossoms are frequently injured by cold winds, and in the latter by spring-frosts, particularly when the trees are planted in the lowest part of a confined valley. A south or south-east aspect is generally preferred, on account of the turbulence of the west, and the coldness of north winds; but orchards succeed well in all; and, where the violence of the west wind is broken by an intervening rise of ground, a south-west aspect will be found equal to any§.”

It has been suggested, that the more early sorts of apples should be planted in southern aspects, and those of the later kinds in northern ones; as by these means the former may be rendered so forward and the latter so protracted as to be less in danger of injury. And where the land of a farm will permit, it is supposed that advantage may be derived from having this sort of trees planted in different situations in respect to exposure; as in

\* Knight's Treatise on the Culture of the Apple and Pear.

† Herefordshire Report, 4to.

‡ Ibid.

§ Knight on the Culture of the Apple and Pear.



this way the chance of escaping blights will be greater, as where one fails the other may succeed\*.

In regard to the choice of fruits for every difference of situation, a writer of experience has remarked, that great attention “ should be paid to select such as are sufficiently early to ripen well in it. A cider-apple may be safely pronounced to be too late for the situation it occupies, when it does not become yellow before the end of October ; and he does not know any disadvantages attending an early maturity, provided the kinds of fruit be capable of being kept a few weeks. An opinion prevails, that the liquors obtained from all early fruits are without strength or body; but the strongest cider yet known is produced by one of these—the *stire*. In cold and unfavourable situations, those fruits will best repay the planter which, in their general character, appear nearly related to the native kind, or crab ; for, though the flavour of these be austere and ungrateful to the palate, the ciders produced from some of them, when they have been thoroughly ripened, are often found smooth and generous. But he would recommend the grafts to be taken from an improved crab, and not from a degenerated apple ; for the former will possess much of the hardiness and vigour, whilst the latter will often inherit the debility and diseases, of the parent tree†.”

Different methods of planting are adopted in different districts, but, according to Mr. Knight, the Herefordshire planters generally perform the business in the “ quincunx form, or in straight lines crossing each other at right angles. The former method is preferred in the hop-yard and pasture, and the latter in tillage, being less inconvenient to the ploughman. But it appears to him, that any given number of trees planted near each other in rows, with wide intervals, would be less injurious, either to pasture or tillage, than in either of the preceding methods. The trees in each row should, in this case, be of the same variety of fruit, that no one, by possessing greater vigour and luxuriance, might overgrow and shade another, and that the whole row might appear a continuation of the same tree. The intervals between would afford considerable space for the plough or pasture ; and every tree, having room to extend its branches on each side, would be more protected than injured by its neighbours, and would attain nearly or quite as large a stature as if entirely insulated. The cider-maker would also be enabled to collect with convenience each kind by itself, and might afterwards mix them according to his judgment or caprice. Unless an orchard be very large, not more than five or six kinds should be planted in it ; and if some of these be such as

\* Herefordshire 4to Report.

† Knight's Treatise on the Culture of the Apple and Pear.



bloſſom early, and others late, the planter will have as good a chance of an annual ſupply of fruit as a larger number of kinds would afford him.”

It is conceived, by the ſame author, that “the diſtance between each row, as well as the ſpace between each tree, muſt depend on the ſituation and ſoil. When the former is high and expoſed, the trees ſhould be cloſely planted, to afford each other protection; and, when the latter is poor and ſhallow, their growth will of courſe be diminiſhed, and they will conſequently require leſs room: but in low and ſheltered ſituations, and deep rich ſoils, where the trees are little expoſed to winds, and attain a large ſize, wider intervals muſt be allowed them. In the former inſtances, a diſtance of twelve yards between each row, and half as much between each tree, will be ſufficient; in the latter, twenty-four yards between each row, and eight between each tree, will not be found too much, particularly if the ground is intended for tillage after the trees have grown to a conſiderable ſize. An opinion rather generally prevails at preſent in favour of planting ſingle trees, at twenty or twenty-five yards diſtance from each other, on arable grounds; and ſpecious reaſons may be offered in defence of this practice: the roots, as well as the branches, are at perfect liberty to extend themſelves in every direction; but the latter are every way expoſed to the ſtorms of autumn and to the cold winds of the ſpring; and trees of more hardy kinds than the apple are well known to grow much better when planted near enough to afford each other protection than when totally inſulated. It may be ſuppoſed, that trees growing in diſtant rows will not regularly occupy the whole ſurface of the ground with their roots; but theſe always extend far beyond the branches, and will meet acroſs very wide intervals. The growth of every inſulated tree is more low and ſpreading, and conſequently more injurious to corn or herbage growing under it. Where the mode of cultivation will admit, the rows ſhould always extend from north to ſouth, as in this direction each part of every tree will receive the moſt equal portions of light and heat\*.”

But the diſtance of the trees when planted in the field is frequently made much greater than the above, as from twenty-two to twenty-four or five; and ſome adviſe the diſtance of ſixty feet every way as the moſt proper and advantageous†. It is probable, however, that in planting at great diſtances there may be inconvenience in reſpect to the produce, from the trees being more expoſed to the cutting winds and froſts.

It is found that “apple-trees are generally the moſt productive of fruit when they are ſituated near the fold-yard, and the ground in conſequence much trodden and

\* Knight on the Apple and Pear.

† Herefordſhire and Somerſetſhire Reports.



manured by the cattle in the winter. The ground in which old apple-trees have grown is esteemed very unfavourable to young ones. When, from contiguity to the house, an orchard is planted in this kind of ground, the pear and apple should be made to succeed each other, as has been judiciously recommended by Mr. Marshall\*."

Experience has sufficiently shown that trees of this sort are commonly "raised with most success, and at least expense, in an old hop-plantation; the ground under this culture being always well tilled and manured, as well as fenced against all kinds of cattle. Considerable advantages may be obtained by planting twice the number which are to remain of trees in each row, using two kinds of fruit, and putting each alternately. The kind which succeeds best may be left, and the other be removed to the tillage. Trees of a large size may be transplanted without the least danger in the autumn, particularly if the roots be shortened in the preceding winter. The subsoil of the ground which suits the hop is not unfrequently too moist for the apple, a defect rarely removed by draining. But where a hop-ground is wanting, trees may be raised in tillage or pasture; but the expense of defending them properly will be considerable, particularly in the latter, in which, though ever so well defended, they usually make but a slow progress. In tillage-land, the least expensive (and perhaps the best) method of raising apple-trees will be to exclude every species of cattle except sheep and pigs, and to defend the trees only with small branches bound round their stems, as in the broom or besom of the farm-house. This fence must begin close to the ground, and rise to a greater height than the sheep or pigs, or the chains of the horses in ploughing, can reach; and to preserve the bottoms of the stems from injury by the plough, a strong oak stake should be driven into the ground on each side of every tree. The small branches which defend the stems will require to be replaced every other year; but this will be done at a very trifling expense†." In the pasture-method of planting the formality of the row may be dispensed with; but the trees will succeed much better if three or five be planted near each other with wide intervals, than if each stand entirely alone‡.

In regard to the method of removing and planting the crab-stocks or apple-trees,

\* Knight on the Culture of the Apple and Pear.

† Ibid.

‡ Mr. Knight observes that, in making a plantation in pasture ground, timber-frames will be necessary. The kind now most in use are made with two flat posts, placed with their wide surfaces parallel to each other, at two feet apart, having boards nailed to their edges on each side, with small distances between them. The trees in this way are perfectly protected from cattle; but when their branches extend themselves, and become agitated with the wind, the stems can scarcely escape being rubbed against the frames. A much better kind of frame is made with three posts, placed triangularly round the tree, approaching each other at the roots and diverging considerably upwards. This appears more expensive than the other; but timber of much inferior value may be used."



the latter of which is mostly used in the field at the time when they first begin to bear fruit, in the former case the stocks are grafted\*. It is frequently the case that too little attention is bestowed to “leave the roots as long, and as little injured, as possible, and not to plant them deeper than they formerly grew. The soil round each tree should be dug eighteen inches deep, and four or five feet wide, placing the sod, if the ground be pasture, in the bottom of the holes, as recommended by Mr. Marshall. If the holes in this case be made six months before the time of planting, and if a small quantity of rich mould be mixed with that of the field, immediately round the roots, it will much accelerate the future growth of the trees; but it will rarely be advisable to make use of any very delicate or highly cultivated fruits when this method of planting is adopted. The branches of the trees, whether grafted or not, and wherever planted, should be much retrenched; and the mould may be raised a few inches round the stems, to prevent their being shaken by the wind. A stake to each will also be of much service; but great care must be taken to prevent the bark of the tree receiving injury by being rubbed †.”

There is another circumstance, especially where the land is somewhat inclining to moisture, that demands attention, which is that of not planting too deep. If so planted as to be capable of resisting the wind, they cannot be placed too near the surface ‡. Much mischief is frequently done by deep planting, as the apple-tree is particularly liable to be destroyed by the stagnation of water about its roots.

In making a plantation, the autumn is the most eligible season; but if, from any cause, the planting be delayed till spring, the trees will succeed perfectly well, if the soil or succeeding season be not remarkably dry. When the trees have once taken root in the hop-plantation or tillage, they will not require any thing more than pro-

\* Mr. Billingsley gives the following directions for planting and grafting this sort of fruit, “As soon as the ground for the orchard is ready, plant your trees (stocks) and be particularly careful not to plant them deep in the ground. After about four years, lop their heads, and graft them with the fruit you most esteem, taking care to adapt your grafts to the stock. In other words, let your grafts, and the trees on whose heads you graft, be as similar in respect to luxuriance as you can; on this a great deal depends. It is found, that a luxuriant gross-growing graft will never succeed on a slow-growing stock, and *vice versa*. It may also be observed, that some excellent sorts of fruit are naturally so slow of growth, that a man, instead of planting for himself, plants for his grandchildren; and if you endeavour to force them (which is often injudiciously done) with luxuriant stocks, you occasion disease. The tree never becomes large or lasting, and the fruit will be tasteless and insipid.”

† The stocks, whether apple or crab, are raised by sowing the seed in drills in a good piece of ground, and keeping the plants clean. Some prefer the apple, others the crab stock; the former comes into bearing sooner, but is more liable to the diseases of the moss and canker, and much less durable. The grafts may be best taken from neither too old or too young trees, but such as are healthy.

‡ Knight on the Apple and Pear.

† Herefordshire 4to Report.



tection from the planter; but in the pasture, the ground should be annually dug three or four feet wide round each, during the first four or five years after they are put in.

Apple-trees being naturally very full of branches, frequently require the operation of pruning; and, when properly executed, great advantages will be found to arise from it: but, as generally performed, the injury the trees sustain is much greater than the benefit they receive. It has been observed that, “the ignorant pruner gets into the middle of the tree, and lays about him to right and left, till he leaves only small tufts of branches at the extremities of the large boughs. These branches, now receiving the whole nourishment of the tree, of course increase rapidly, and soon become, when loaded with fruit or snow, too heavy for the long naked boughs, which are of necessity full of dead knots from the former labours of the pruner, to support. Many hundred trees annually perish from this cause. It is believed, the present system of pruning ought to be precisely reversed, and that the pruner should confine himself almost entirely to the extremities of the bearing branches, which are always too full of wood, and leave the internal part of the tree nearly as he finds it. Large branches should rarely, or never, be amputated\*.”

The principal reasons of trees of this sort not producing fruit as regularly as crops in any other cases, are the effects of frost in the spring months, as in April, and those of blights in the following. The former is found to be most dangerous when it comes on suddenly, while the *blow* is moist. It has been remarked by the author of the *Philosophy of Agriculture and Gardening*, “that the early blossoms of apple and many other trees are frequently destroyed by an excess of cold; and Mr. Knight asserts, that the haziness of the air which usually accompanies warm days and frosty nights, with a north-east wind, in the spring, is injurious to the blossom of every tree, and particularly so to that of the apple; for the warmth of the day hatches the eggs of the insect which breeds in it, whilst the coldness of the night, by checking the progress of the sap, retains the blossom in its half expanded state to form a nidus for it. This insect, which assumes the winged state in July, is a small brown beetle, and that it then probably lays those eggs on the trees, which, if the succeeding season be unfavourable, prove destructive of the future crop of fruit†.” And it is further observed that, “the leaves and blossoms of the apple-tree are sometimes entirely destroyed by a numerous tribe of caterpillars, some kinds of which become moths in the summer and autumn, and others in the succeeding spring, as well as by a minute insect of the cochineal tribe”. The same writer adds that “the blossoms of the apple appear to fail not unfrequently from want of impregnation, when the weather is unusually hot and dry, or when cold winds prevail;

\* Knight on the Apple and Pear.

† Ibid.



as he has often observed the *farina* to wither and die on the *antheræ* in such seasons. In each of these cases he has always seen those trees most productive, which, having had the good fortune to escape the desolating hand of the pruner, were moderately full of wood, and capable of affording their blossoms some protection from frost and cold winds, or excessive heat."

After the apples have remained upon the trees till they are become in a proper state of ripeness, they are then to be carefully gathered, and properly separated, as the goodness of the liquor in some measure depends upon this being properly performed. It has been advised that "those whose rind and pulp are tinged with green or red without any mixture of yellow," as that colour disappears in the first stages of fermentation, should be kept perfectly separate from such as are yellow or yellow blended with red. The latter sort after being left on the trees till sufficiently ripe to fall without much shaking, "are alone capable of making fine cider†." When thus separated, they should be kept till quite mellow, which is best done by exposing them in a thin layer to the influence of the sun and air in some convenient covered situation, as by that means the liquor will be stronger and the danger of an unpleasant flavour be avoided. No precise rules have been laid down for ascertaining the most advantageous degree of maturity to which they should be brought for this purpose, but it is suggested that as long as they become more yellow without rotting, they may improve. In this state they are fit for being converted into cider by the proper process‡.

\* Knight on the Apple and Pear.

† This is a process that is much too extensive, and which does not properly belong to a work of this kind; but the following practical directions, given by the author of the Somersetshire Corrected Agricultural Report, may probably be useful:—

"The fruit being properly matured, every necessary utensil ought to be set in order for cider-making; the mill, press, tubs, casks, and pails, clean washed, and suffered to dry before they are used.

"Several methods are practised for converting apples into *pommage*; but the two most chiefly in use are the bruising-stone with a circular trough, and the apple-mill. The best internal construction of a mill seems to be that which has two pair of rollers, the upper pair being stuck with *coggs* and *dags*, and the under pair, being of very hard wood, turned smooth, and worked with coggs only. The upper rollers grinding the apples to a coarse *pommage*, and the under ones squeezing it to a very fine pulp.

"The apples being, by either of the foregoing methods, properly bruised, the *pommage* is carried to the press, and a square cheese made thereof, by placing very clean sweet straw or reed between the various layers of *pommage*, or else by putting the same into hair cloths and placing them one on another. It is of importance that the straw or reed be sweet and perfectly free from any mustiness, lest the cider be impregnated therewith.—Particular care ought also to be taken to keep the hair cloths sweet by frequent washing and drying, else the ill effects of their acidity will be communicated to the cider. To this cheese, after standing a while, a slight pressure is at first given, which is gradually increased until all the juice or *must* be expressed; after which this *must* is strained through a sieve and put into vessels.



There is little difference necessary in the method of planting pears from that which has been laid down for apples; except in their being best raised on their own sort of

Here the great art of making good cider commences. "It is well known that there are various stages of fermentation in this juice, each of which changes the very quality and nature of the fluid; but the principal which are to be particularly attended to here are three; namely, the vinous the acetous, and the putrefactive. The first converts the *must* from its turbid fulsome state, to a transparent spirituous liquor. If the juice be expressed from sour apples, this fermentation is perfected in two or three days; but if from sweet apples, not under a week or ten days.

"The next stage of fermentation gives an acidity to the vinous liquor before spoken of, converting it to vinegar. This fermentation begins soon (frequently in a few hours) after the vinous is ended; and, if the fermentation be improperly hastened by heat, *before* the vinous is perfected. The third (and all succeeding fermentations) disengages an alkali from the liquor, and gives it a tendency to putrefaction.

"To regulate the first, and to check the others, is then the great business of the cider-maker. It is well known that fermentation should not by too much heat be carried on rapidly, nor by extreme cold too slowly; as in each case the fermenting body will be injured. Hence it appears that a certain degree of warmth, or rather imperceptible heat, conduces best to regulate this operation. This degree of warmth may be understood to rest between thirty-eight and forty-six degrees of Fahrenheit's thermometer. If then the warmth of the cellar in which new-made cider is placed be between these points, we may expect (no adventitious cause interrupting) that the vinous fermentation will commence and go on with due regularity.

Fermentation is an intestine motion of the parts of a fermentable body; this motion, in the present case, is always accompanied with a small hissing noise and evident ebullition, the bubbles rising to the surface, and there forming a scum or soft spongy crust over the whole liquor. This crust is frequently raised and broken by the air as it disengages itself from the liquor and forces its way through it. These effects continue while the fermentation is brisk, and at last gradually cease. The liquor now appears clear to the eye, and has a pungent vinous sharpness upon the tongue. This is the critical moment which the cider-maker ought not to lose sight of; for if he would have a strong and generous liquor, all further sensible fermentation must be stopt. This is best done by racking off the pure part into open vessels, and placing them in a more cool situation for a day or two: after which it may again be barrelled and placed in some cool place for the winter. It is possible, however, that a variety of avocations at the season of cider-making may take off the farmer's attention, and give opportunity to the acetous fermentation to come on ere he is aware of it.

"The most popular remedies in this case are the following:—a bottle of French brandy, half a gallon of spirit extracted from the lees of cider, or a pailful of old cider poured into the cask, soon after the acetous fermentation is begun: but it is not to be wondered at if all these should fail if the cider be still continued in a close warm cellar. To give effect to either, it is necessary that the liquor be as much exposed to a colder atmosphere as conveniently may be, and that for a considerable length of time. By such means it is possible to repress the second fermentation in a great measure; and if a cask of *good* cider cannot from thence be obtained, a *tolerable* one may.

The *Stumming* of cider is a provincial phrase, signifying the fuming a cask with burning sulphur; and is thus performed:—Take a strip of canvas cloth about twelve inches long and two broad, let it be dipped in melted brimstone. When this match is dry, let it be lighted and suspended from the bung of a cask (in



stocks, their requiring wider intervals from their taller growth, and being planted, whether in the orchard or in the tillage-land, at much greater distances; in the former at not less than eighteen yards distance in the rows, and eight or nine from tree to tree, and in the latter not less than twenty-five or thirty between the rows. The form and stature of the different varieties must also be regarded, and only one sort be planted in a row. And as in some sorts the fruit is only produced on the outsidés of the branches exposed to the sun and air, while in others it is in every part of the tree, it is recommended that the former sort should be planted at greater distances than the latter kind. From the irregularity of the ripening of the fruit, a great number of trees of the same sort is necessary to afford a sufficiency for being ground at a time\*.

It has been found by the same writer that the produce of an acre of land planted with apple-trees is nearly a third less than the same extent planted with pear-trees;

which there are a few gallons of cider) until it is burnt out: the cask must remain stopped for an hour or more, and then be rolled to and fro, to incorporate the fumes of the match with the cider, after which it may be filled. If the stumming be designed only to suppress some slight improper fermentation, the brimstone match is sufficient: but if it be required to give any additional flavour to the cider, some powdered ginger, cloves, or cinnamon, &c. may be strewed on the match when it is made: the burning these ingredients with the sulphur will convey somewhat of their fragrance to the whole cask of cider; but to do it to the best advantage, it must be performed before the vinous fermentation be fully perfected.

To perfect a vessel of cider, after the foregoing steps have been taken, it will be found necessary now and then to supply the waste occasioned by evaporation and insensible fermentation with fresh cider; and about the the beginning of April following to give it a final racking. At this time a commixture of cider made from Jersey or any other luscious and sweet apple, with that of the four apples, may be recommended, to give it a general regular colouring.—Should, however, a higher colouring be required than what results from such commixture, a small quantity of burnt or melted sugar, prepared in the following manner, will produce the desired effect:—Take a pound of sugar, and put it into a stew pan with a little water, and place it over a clear fire, stirring it frequently till it turns black; take it off the fire, and as it cools apply some cider thereto, by little and little, and continue stirring it till it be thoroughly mixed. This colouring tinges to perfection; it is very cheap, gives no luscious sweetness, but rather an agreeable bitterness, and thus recommends itself to the nicer palates. Soon after this, in the same month, the cider may be bottled; and by the month of June the owner may expect to find himself possessed of a rich, pleasant, and wholesome liquor.

More full directions for the conducting of this process are given in Mr. Knight's valuable Treatise on the Culture of the Apple and Pear; and the principles on which it proceeds chemically explained. And also in Mr. Crocker's Essay on the same subject.

The same rules in a great measure hold good in the process of making the perry, except in its requiring more art in the fining of the liquor and a more equal situation in respect to temperature.

\* Knight on the Culture of the Apple and Pear.



but then the apple-tree begins to bear much earlier, and cider is justly a preferable liquor to that of perry.

In respect to the loss in the pasture where the land is closely planted with apple-trees, though it may be considerable, it will seldom be more than one-tenth of the value of the fruit. Besides, the grass produced in these situations is highly valuable from its coming early in the spring when much wanted; and if kept closely fed down, and prevented from becoming coarse, will support much stock\*.

In short, it is remarked by Mr. Knight, "that such lands as produce but a scanty herbage may frequently be converted into excellent orchard ground. As an instance of the advantage in this way, an orchard of this sort, which for the last thirty years has afforded a produce not much less than four hundred gallons the acre, would not, it is supposed, if the trees were wholly removed, support two small sheep during the year with facility. The soil is of the indurated, deep, stiff, clayey kind, which, it is conceived, would be less worth twelve shillings an acre as a pasture, than it is worth three pounds an acre as an orchard."

It is added, "that there are in this island many hundred thousand acres equally capable of being improved to the same extent by planting with apple and pear-trees, which might be effected at a very small expense, from the trifling value of the plants†."

The same writer has likewise suggested, that by distributing a few trees of the apple and pear kind thinly over the meadow and pasture lands in all those districts where they could be planted with success, but little injury would be done to the herbage; while a sound palatable liquor would be provided for the whole of the population employed in the business of husbandry, and in productive seasons a supply afforded for other purposes; besides advantages derived in the saving of barley, as well as the prevention of so many acres being cultivated under the hop-system‡.

*Timber-Trees.*—In the raising of timber or other forest-trees, almost every thing depends upon properly adapting them to the particular nature of the land, its being in a suitable state of preparation for their reception, and the planting being performed at a proper season in a perfect manner and at proper distances, according to the nature of the trees and situation. There are likewise a few other circumstances that demand attention in conducting this business in the most effectual manner, which are those of keeping the trees perfectly clean and free from all sorts of rubbish, and the shade or annoyance of other sorts of plants, especially during their early growth, and at the

\* Knight on the Apple and Pear.

† Ibid.

‡ Ibid.



same time having them well sheltered and secured from the intrusion of all sorts of live stock. It is only by attention in these different respects that plantations of any kind of trees can be raised with any degree of certainty or success.

The particular kinds of soil best adapted to the cultivation of the different sorts of timber trees, and in which some or other of them will be found to grow in the most perfect manner, are gravelly or light sandy soils, with free porous subsoils; gravelly or sandy loams on porous subsoils; loamy, sandy, or gravelly soils on retentive subsoils; gravelly chalk or chalky loams on porous subsoils; loamy clays or clayey loams on porous subsoils; and strong clayey or loamy soils on retentive subsoils. Likewise thin moorish heathy soils on gravelly or porous subsoils, also on clay or retentive subsoils. Such soils as are of a ferruginous kind, and of little depth, are found the most unfavourable to the growth of timber, especially where the subsoil is retentive, as the destructive moisture in such cases stagnates near the surface, and deprives the roots of those healthy materials which they should take up for the purpose of nourishment and support.

In forming plantations, besides the necessity of having them properly secured by good fences, if the soils be not sufficiently dry, recourse must likewise be had to draining to take off the superfluous water: the situation and soil being thus attentively considered and prepared, a proper selection of plants should be made. Such as most particularly deserve attention for waste lands, are oak, ash, elm, beech, birch, sycamore, larch, and the various kinds of fir. The oak has been found to thrive on soils of very opposite qualities, but those of a dry, deep, firm nature are best adapted to it, with a proper degree of shelter. The ash prospers in almost every dry soil, even in exposed situations; in rather damp and free mellow soils the elm is to be preferred, especially for waste lands; if in very elevated places a chalky, gravelly, or light loamy soil abound, the beech may be planted with success. In all soils and situations the larch is found to thrive where the Scotch fir cannot be raised, and the latter is proverbially known to succeed in the poorest and most elevated places\*.

\* Nicol on Planting.

\* Knight on the Apple and Pear.



In the table below a view is given of the nature of the soil in which different sorts of timber-trees are found to succeed in the most certain manner, with the uses to which they may be converted\*.

| * Surface Soil.                  | Subsoil.                                 | Common Growth.                               | Planted Growth.                           | Uses of.                                                                                 |
|----------------------------------|------------------------------------------|----------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------|
| Heavy and gravelly Loams.        | Heavy Loam with Chalk.                   | Birch, Hornbeam, Oak, Ash, Hazel, Beech, &c. | Oak, Ash, Chestnut, Willow, Lime, Walnut. | Timber, Hop Poles, Cord Wood, Hurdles, Bavins for Bakers, and Lime.                      |
| Sandy Loams.                     | Heavy Loam.                              | Ditto.                                       | Elm, Beech, Weymouth Pine, common Spruce. | Ditto.                                                                                   |
| Flinty strong Loam.              | Heavy Loam.                              | Ditto.                                       | Willow and Chestnut.                      | Timber, Fencing, Poles, and as above.                                                    |
| Gravelly and sandy Loams.        | Gravelly Loam.                           | Ash, Beech, Oak, Hazel, &c.                  | Chestnut, Ash.                            | Hop Poles, Fencing Poles, and all as above.                                              |
| Gravelly sandy and flinty Loams. | Heavy gravelly flinty Loam.              | Ash, Beech, Hornbeam, and Oak.               | Ash, Beech, Larch, &c.                    | Timber, Fencing, Hop Poles, Cord Wood, for Charcoal, Bavins, &c.                         |
| Flinty dry poor gravelly Loams.  | Chalk at 2 feet depth with gravelly Loam | Beech, Oak, &c.                              | Beech, Larch, &c.                         | Cord Wood, Bavins, and Hop Poles.                                                        |
| Flinty and gravelly Loams.       | Chalk 4 ft. with deep gravelly Loam.     | Ash, Oak, Hazel, &c.                         | Ash, Larch, &c.                           | Cord Wood, Hop Poles, Bavins, Stakes, Ethers, &c.                                        |
| Ditto.                           | With a few Flints, but nearly as above.  | Oak, Hazel, Beech, and Ash.                  | Chestnut, Ash, and Willow.                | Hop Poles, Fencing, Poles, Stakes, Cord Wood, &c.                                        |
| Lightish black Loam.             | Dry sandy Gravel.                        | Birch, Elm, Ash.                             | Ash, Elm, &c.                             | Various Uses in Husbandry.                                                               |
| Flinty gravelly Loams            | Strong Loam with Flints.                 | Oak, Ash, Beech, &c.                         | Ash, &c.                                  | Poles, Bavins, Cord Wood, &c.                                                            |
| Chalky flinty gravelly Loam.     | Chalk with some gravelly Loam.           | Ditto.                                       | Ditto.                                    | Ditto.                                                                                   |
| Gravelly Loam.                   | Heavy flinty and poor Loam.              | Oak, Ash, Hazel, and Beech.                  | Ash, Oak, &c.                             | Common Produce a few Poles, Cord Wood, Bavins, &c. Plantation many Poles, and the above. |
| Gravelly and chalky Loams.       | Gravelly Loam with Chalk.                | Oak, Ash, &c.                                | Ash and Chestnut.                         | Poles, Cord Wood, &c.                                                                    |
| Gravelly Loam.                   | Ditto.                                   | Ash, Oak, and Beech.                         | Oak, Larch.                               | Ditto.                                                                                   |
| Ditto.                           | Gravelly Loam and heavy Loam.            | Ditto.                                       | Scotch Pine.                              | The same.                                                                                |
| Sandy Gravel.                    | Gravelly and Sandy Loam.                 | Ditto, Scotch Pine.                          | Larch, Chestnut, &c.                      | Poles, Stakes, Ethers, &c. &c.                                                           |
| Stone Shatter and gravelly Loam. | Strong Loam with Ragstone.               | Oak, Hazel, Birch, &c.                       | Birch, Oak, &c.                           | Oaken Tillers, small Timber Poles, &c.                                                   |
| Stone Shatter and gravelly Loam. | Gravelly Loam with some Stone.           | Oak, Birch, Aspen, Hazel, and Ash.           | Ash, Chestnut, and Willow.                | Fencing Poles, Hop Poles, Cord Wood, &c.                                                 |
| Gravelly Loam.                   | Gravelly Loam with some Stones.          | Oak.                                         | Chestnuts.                                | Hop Poles, Fence Poles, &c.                                                              |
| Sandy Loam.                      | Gravelly Loam.                           | Birch, Oak, Hornbeam, &c.                    | Chestnut, &c.                             | Fence Poles, Hop Poles, &c.                                                              |
| Sandy Loam and Stone Shatter.    | Gravelly Loam with Ragstone.             | Oak, Beech, Birch, Hazel, Ash.               | Ditto.                                    | Ditto.                                                                                   |
| Gravelly Loam and Stone Shatter. | Deep Loam, heavy Clay, and Gravel.       | Ditto.                                       | Ditto.                                    | Ditto.                                                                                   |
| Ditto.                           | Gravelly Loam.                           | Ditto.                                       | Ditto.                                    | Ditto.                                                                                   |
| Gravelly and sandy Loam.         | With strong Clay and Loam.               | Oak and ditto.                               | Ash, Larch, &c.                           | Poles, Fire Wood, &c. as above.                                                          |
| Gravelly Loam flinty.            | Gravel with Clay, and some Flint         | Scrubby Oak, Hazel, &c.                      | Oak, Ash.                                 | Timber and ditto.                                                                        |
| Wet spongy Land.                 | Moist and boggy Earth.                   | Alder, Willow.                               | Alder, Osier, Willow, &c.                 | Hurdles, Hop Poles, &c.                                                                  |
| Drier ditto.                     | Ditto more dry.                          | Poplar.                                      | White Poplar, Willow.                     | Hop Poles, &c.                                                                           |
| Light sandy Loam.                | Dry gravelly Earth.                      | Mountain Ash, Ash.                           | Scotch Pine, Silver Fir.                  | Hop Poles.                                                                               |
| Light gravelly Loam.             | With dry Gravel.                         | Ash.                                         | Sycamore,                                 | Timber-Turnery, &c.                                                                      |



In planting, where it is performed on the more elevated or mountainous tracts, warmth and shelter are to be considered, as without these the trees seldom thrive in a perfect manner. In such situations there is, in general, the most difficulty and the least progress made in the raising of timber-trees; the success of the planter depending greatly upon fixing on such sorts of timber-trees as may in future become the most highly valuable, on planting thickly with plants of not too large a size, and on a considerable plot or extent of ground both in length and width being planted\*.

In these unfriendly situations to the growth of trees, small plants must consequently be chosen and planted thick on the ground; as the winds are very prejudicial to trees of a large stature, by loosening the roots and frequently breaking the fibres: but though this is the most disadvantageous situation for planting, it is possible, with proper care in the above respects, to rear young timber in it. Where it is intended to cover a mountain from its base, it will be most conveniently done by planting round the base in the first instance, rising gradually; by which means an artificial shelter will be forming, from the progress that will be made by the trees that were first planted, especially if the extent is such as to require several seasons to complete the planting. The portion first planted should be pretty extensive, in all such cases especially where shelter is principally intended.

The kinds of trees to be chosen for such situations must be regulated, in a great measure, by the soil. The pine would perhaps be found to flourish most, but the larch is preferable as a nurse. The mountain-ash, the beech, the ash, the sycamore, the birch, the fir, &c. may all be planted with reasonable hope of success; and where the soil is deepest and richest, the oak†.

In low sheltered situations, where the inconvenience of exposure to the winds is obviated, timber-trees may be planted with greater certainty of success; the chief care necessary in this case being to fix on trees of a proper kind, and placing them at proper distances, according to their sorts and sizes. As these situations admit of most kinds, on the more sheltered parts, the oak, larch, elm, beech, horse-chestnut, walnut, lime, spruce and silver fir may be suitable; and on the less sheltered portions, the ash, birch, sycamore, hornbeam, mountain-ash, and fir, with a mixture of larch.

The banks of rivers and canals are mostly favourable for the planter's purpose, and most sorts of timber and other woods may be raised in such situations; the oak, elm, poplar, willow, and osier, according as they are more or less dry; but the preference must depend on the local circumstances of the different cases.

\* Nicol on Planting.

† Ibid.



Situations near the sea-coast, or what are called maritime situations, are in general inimical to the growth of timber ; but where such are attempted to be planted, the beech and fycamore will be found to bear the sea breeze better than most others, and consequently become desirable as nurseries for the other trees. In these situations, where the bank rises high, the best mode may be to plant in the face of it, considerably within the level of the top, in order to afford a screen for the trees within till they rise to a sufficient height : and where it is flat, to adopt the method of planting in belts, beginning as close as possible to the edge of the water, and planting the first rows very close, as about thirty inches distance, employing stout well-rooted plants of not more than twelve or eighteen inches growth\*.

There are two different methods principally pursued by planters in providing the trees : one is by raising the plants, in a detached piece of ground, as a nursery, from the seed ; the other by purchasing the trees from the nurseries in the neighbourhood in the states proper for being planted out. The former is probably the best and most economical plan, where the business of planting is to be conducted upon an extensive scale, as it is mostly troublesome and often impossible to procure the quantity or sorts of plants that are wanted at the proper season. Besides, the plants in general succeed better when they are put in as fast as they are removed. But for small concerns it is in most cases more advantageous and convenient to obtain them from a nursery, as they can never be raised upon a small scale so cheaply as they may be provided in this way. Wherever nurseries are attempted, the nature of the land should be tolerably good, as it is almost impossible to raise good plants on very poor soils. Different sorts of land have been recommended for this purpose : but it is evident that no one kind can be fitted to the growth of every sort of tree ; yet such as are dry and friable, without being too light, are capable of raising healthy trees of most kinds. A late writer† has recommended for this purpose “ a loam of a middling texture, rather inclining to sand, neither rich nor poor, from eighteen to twenty-four inches in depth ; lying on a free, porous substratum. This will be found more generally congenial to the nature of the different forest trees than any other soil. But there is no general rule without exception. If there be a diversity of soils, and if they do not too nearly approach the extremes of meagre sterility and excessive fertility, so much the better, since all the kinds do not exactly thrive alike in the same soil ; and an opportunity would thereby be afforded of placing each in that more congenial to its nature. The site should neither be high nor low, sheltered nor exposed, in any extreme, for the same

\* Nicol on Planting.

† Ibid.



reason, viz. that it may the more generally answer all purposes. For a nursery of this description, nothing can be more eligible than the spot which may occasionally be occupied as a kitchen-garden. The pulverization and mellowness afforded by the previous growth of various culinary crops, bring the land into the most suitable state for the raising of young trees, and at the same time clear it the most effectually from vermin, as the grub, and other insects\*."

The ground should constantly be well dug or trenched over to its full depth; and, when necessary, well dressed with composts of lime, marl, dung, and other

\* For the extensive plantations of the Duke of Portland, in Nottinghamshire, where the soil is of a light sandy kind, "some well situated valley is chosen, as near the centre of the intended plantations as possible, for the purpose of a nursery. If this valley is surrounded with hills on all sides but the south, so much the better. A piece of ground, consisting of as many acres as is convenient for the purpose, is fenced about in such a manner as to keep out all noxious animals. At each end of the nursery, large boarded gates are fixed, and also a road made down the middle wide enough to admit carriages to go through, which is found exceedingly convenient in removing the young trees from thence to the plantations. After the fence is completed, the ground on each side the road is trenched about twenty inches deep, which may be done for about 3*l.* 10*s.* or 4*l.* per acre, according as the land is more or less gravelly. It is best done in the spring, when the planting season is over. If after the trenching, two or three chaldron of lime be laid on an acre, the land will produce an excellent crop either of cabbages or turnips, which being eaten off by sheep in the autumn, will make the land in fine order for all sorts of tree-seeds: but as the oak is the sort of tree cultivated in general; this is the method pursued in raising and managing that most valuable species:—"In the autumn, after the cabbage or turnips are eaten off, the ground requires nothing more than common digging. As soon as the acorns fall, after being provided with a good quantity, sow them in the following manner:—Draw drills with a hoe in the same manner as is practised for pease, and sow the acorns therein so thick as nearly to touch each other, and leave the space of one foot between row and row, and between every fifth row the space of two feet for the alleys. While the acorns are in the ground, great care must be taken to keep them from vermin, which would very often make great havock amongst the beds if not timely prevented. Let this caution serve for most other sorts of tree-seeds."

After the acorns are come up, the beds require only to be kept clean from weeds till they want thinning; and as the plants frequently grow more in one wet season where the soil is tolerably good, than in two dry ones where the soil is indifferent, the time for doing this is best ascertained by observing when the tops of the rows meet; which is done, when that is the case, by taking away one row on each side the middlemost, which leaves the remaining three rows the same distance apart as the breadth of the alleys. In taking up these rows, the workman ought to be careful neither to injure the plants removed nor those left on each side. The rest of the young oaks being now left in rows at two feet apart, let them again stand till the tops meet; then take up every other row, and leave the rest in rows four feet asunder, till they arrive to the height of about five feet; which is full as large a size as is ever wished to be planted. In taking up the two last sizes, the method is to dig a trench at the end of each row, full two feet deep, then undermine the plants, and let them fall into the trench with their roots entire:—the same mode is necessary with other sorts of trees, very much of their future success depending on this point, their being well taken up.



similar substances; but other sorts of manure should always be applied with the previous crops, and not those of the tree kind\*. The method of cropping must depend on the nature of the land and circumstances.

After the plants have been kept in the seminary for about two years, in most of the sorts they should be removed to this nursery, and planted in rows or lines about twelve or more inches apart, according to their sort, and from three to five in the rows, where they may remain for two years longer, and then be finally planted out.

The next thing to be attended to, where the ground has been properly drained, is that of preparing the land for the reception of the plants. In this business great care is necessary, as much depends upon its being in a good condition for the reception of the plants. It is performed by the plough or the spade, according to the different circumstances of the land. When coarse plants prevail, such as heath, furze, broom, &c. they must be fully destroyed by stubbing, burning, or otherwise clearing away. When burning is practised, the ashes should be blended with the soil, as they are found of great service in promoting the growth of the plants.

The mode of preparation by the plough on tillable sites, and where the soil is thin, is the cheapest and most effectual of any. Where the land has been in tillage, it wants nothing more than two furrows, and an equal number of harrowings, to render it fit for the reception of the trees. But where it is in lay, a crop of oats, &c. should be taken the season before planting; or, if it is stubborn, a second crop, perhaps of beans, turnips, or potatoes, will be necessary; previously ploughing and harrowing well, and laying the land up in a perfect method. A trench plough is frequently used for this purpose, which stirs the ground to the depth of twelve or fifteen inches. In this method it is essential to plough to the full depth each time.

When the spade is employed, which must be the case in steep situations where the plough cannot come, and where there are rocks, stones, or other obstructions; in this method the best planters advise, that the holes or pits should be made to the full depth of the soil, and sufficiently large according to the size of the trees. For those of eighteen or twenty inches in height, whose roots occupy about nine inches when spread out, holes of fifteen inches in diameter may be sufficient. This must, however, be regulated by the judgment of the planter. As it is of great advan-

\* Nicol on Planting.



tage to the trees that the turfy matter should be well broken down and reduced before the time of planting, it may be useful to have holes made a proper length of time before the trees are put in, to admit of this being fully effected, especially on the drier and more light soils.

From the desire of early appearance, it has been too much the case to plant forest-trees of too great growth. It is obvious, however, that there will be not only much saving of expense, but a much greater certainty of success, in planting small young trees than such as are large and of greater age. Such as have been in the nursery two, three, or four years, according to their kind, may in common be the most advantageous as timber-trees. Mr. Nicol observes that “deciduous trees of all kinds, except the larch, of from three to five feet in height, being carefully raised with good roots, will generally succeed.” He has, however, shown, that a one year’s seedling larch, nursed one or at most two years, will outdo all others of its kind in any soil or situation, and therefore advises planting trees of this age only. Firs of any kind will succeed better if under than above thirty inches, even in the most favourable soil and situation. Most generally those of fifteen or eighteen inches in height are to be preferred. From this view of the subject, it may occur to some, that to plant seedlings only would be the most advisable and least expensive method. That it would be the least expensive method is obvious; but, that it is most advisable, except for the Scotch and spruce-firs, may, he thinks, be disputed.

“As the chief property of any young tree, intended for transplantation, consists in a multiplicity of healthy fibres; hence the necessity of nursing, in *kindly soil*, for a year or two, all *tap-rooted* plants, for the attainment of this object, and that we may commit them to the less genial soil and more untoward situation with greater probability of success. For, whether shall we suppose the plant which has both root and branch to make, or that which has the latter only, in the first season after so important a change of habit, is more likely to succeed?—The latter, certainly. From which alone may be demonstrated the cause why plants of this description surpass those of greater size, as above stated. These are raised with unbroken, tufty, and fibry roots; those with maimed, lank, fibreless ones; nor do they, with the utmost skill and attention, bear such proportion to the top. Consequently, the fibrils cannot afterwards, by the utmost efforts of human art, be induced so immediately to seek pasturage for the sustenance of the trunk.” For though lopping may in a great measure obviate this, injury is thereby done to the tree. In all soils and situations it is the safest and least expensive method to plant young healthy well-rooted plants.



The circumstances to be next considered in this business are those of the distance and manner of planting: on these points Mr. Nicol's directions are, that "for the most exposed, bleak sites, and barren soil, from thirty to forty inches may be considered as a good medium; varying the distance according to circumstances. For, in an extensive tract, it will hardly happen that there is not a variety of soils. Some parts may be deeper and more loamy; others more gravelly or rocky. In the former, the greater distance may be advisable; in the latter, the lesser.

"For less exposed sites, and where soil is found above six inches in depth, from four to five feet will be a good medium; varying the distance according to circumstances, as above.

"For belts, stripes, or clumps, whose breadth or diameter does not exceed a hundred feet, lying in a bleak situation, and of thin soil, the margin, on all sides, should be planted at not more than two feet apart; the interior parts at three. Those lying on a more sheltered situation, and of deeper soil, may be allowed distance according to circumstances. But narrow stripes, or small clumps, even if the soil may be termed *good*, should generally be planted *thicker* than a more extended mass, that the plants may afford each other shelter.

"For the most sheltered sites, where the soil is deep, good, and where apparently every plant will grow, six feet will be a good medium distance. Wider than this, he cannot approve in any case whatever; because, at this distance, the plants have room to grow till their thinnings become useful. But, even were this not an object, there is a greater; namely, that the plants may not grow too squat in their infancy, and that the "pruning-hook" be not much wanted in the formation of stately timber."

It is conceived that "he who who plants too thin, with the idea of saving trouble in thinning, deviates as widely from the right path, as he who thins none at all." It is therefore contended "that thick, rather than thin planting, is the safer side to err on. By which mode, also, there is a more equal crop on the ground, beeting or filling up vacancies being much less necessary\*."

Contrary to the common practice, it is supposed that thick planting is most necessary where the plants are largest, as the greatest number die in these cases.

In the Duke of Portland's plantations, where trees of various sizes are planted in an irregular manner, the number upon an acre is usually about two thousand.

In respect to the manner of setting the trees in the plantations, it is probably the

\* Nicol on Planting.



best method, except where vegetable crops are to be cultivated between, to plant without any regular order, though the line or row manner is frequently practised, as being the least troublesome and expensive.

There is another point to be regarded in the planting of timber trees, which is, that of the most advantageous manner of intermixing the trees. Some have advised the planting in groups, to prevent the supposed injury of trees of different sorts growing together: others, however, prefer the mixed method, not only as affording a better means of ascertaining what sorts of timber trees succeed best, but as enabling the planter to protect them more effectually. It has been suggested that "it matters little whether we plant in distinct groups or in indiscriminate mixture; provided, in the latter case, we ultimately retain the most profitable and flourishing kinds only. For, with the proviso that most of the kinds evidently adapted to the soil and situation be planted according to the mode of thick planting, a sufficiency of them will remain, after all others are thinned away, for a full and final crop. For instance: if it should be supposed that the soil is best adapted to the oak; that it is desirable to raise the most valuable kinds rather than the decorative; and that, exclusive of the larch for nurser, and a few firs to enliven the borders, six kinds are to compose the mixture; plant two oaks for one elm, two elms for one beech, two beeches for one ash, two ashes for one birch, and two birches for one sycamore. And thus will the plantation at once be formed, in uniform gradation, of kinds most likely to succeed each other, in the case of either disagreeing with the soil or climate; and which also succeed each other in respect of value as timber: doing justice, at least, to the patriotic intention of the planter, should the first and more valuable kinds fail\*."

It is of the utmost importance, as has been already seen, in raising plantations of the timber kind, especially in bleak exposed situations, that warmth and protection be afforded by the judicious use of trees of quick erect growth and numerous branches. It has been observed, that in all situations, and on all soils, except those termed humid, and which are adapted to the aquatic kinds only, the larch is without doubt the most proper nurse, and therefore should take preference of all others for this purpose. But that on sub-humid, or loamy soils, the Lombardy poplar and Huntingdon willow are good substitutes; and, when variety is the object, ought to be mixed with the larch, for the purpose of nursing the other more valuable kinds. And that on elevated, poor sites, the mountain-ash, for the first ten or

\* Nicol on Planting.



fifteen years, is outdone by the larch only, in the office of nursing, and is justly admitted for the sake of variety. In all situations, this plant grows quickly in youth. In maritime situations, the sycamore is likewise eminently useful for this purpose. "Few trees, except the above, grow faster in youth, and none are more patient of the sea-breeze. Consequently, when the site is much exposed thereto, this tree should be freely planted in mixture with the larch for nursing the oak, beech, elm, &c. if the intention be the culture of ship-timber\*." The common pine may sometimes be useful in this view, and afford greater variety. The proportion in which trees of this sort should be employed, must obviously depend on the peculiarity of the situation, and other circumstances. Some recommend in thin soils, and bleak situations, tree for tree; and in less exposed situations, and better soils, one nurse for two principal trees; and in most sheltered situations, with good soil, one nurse for three, four, or five principal trees may be a sufficient allowance. On the most exposed and bleak situations, where the soil is evidently sterile, the safest way is to plant too many rather than too few†.

We come now to the business of planting out the trees. The season for performing this to the most advantage, and with the greatest chance of success, must differ according to the nature of the soils and the plants, as well as the state of the weather. In the more porous dry soils, with the hardier sorts of trees, the autumn, as from the middle of October to the latter end of November, may be the most suitable; as they will be better established against the summer heats, which are often destructive to new planted trees. But in the more heavy and moist soils, especially those of the clayey and loamy kinds, and with the less hardy sorts of trees, the early spring season, as from the middle or latter end of February to the beginning of April, may be the most proper. The condition of the land should be particularly attended to in this business, as it is equally improper to plant when either in too dry or too moist a situation. It has been well remarked, that "at a time when the soil is neither wet nor dry, the operation of planting is most easily, and also most successfully, performed. The mould adheres not to the spade, nor does it *run in*; it divides well, and with little trouble intermingles with the fibres; nor, in the operation of treading and setting the plant upright, is it wrought into a mortar, to the evident prejudice of the plant, whatever weather may ensue. Consequently, on a retentive soil, it cannot be proper to plant in time of rain, nor

\* Nicol on Planting.

† Ibid.



in many cases for a day or two afterwards; nor after a fall of snow, until for several days it has entirely disappeared. Whereas, on a dry absorbent soil, it may be very proper to plant in time of gentle rains, immediately after heavy ones \*, or on the snow disappearing.

The differences in the forwardness of the vegetation of different sorts of trees should also regulate in some measure the time of planting, where those of the same sorts are only made use of. In this view, it is advised that the larch, elm, sycamore, lime, horse-chestnut, mountain-ash, birch, alder, poplar, willow, &c. should be put in by the beginning of March; and that the oak, birch, ash, chestnut, hornbeam, &c. be finished planting by the beginning of April at the latest. The best season for the planting of many trees of the evergreen kind, such as the Weymouth pine, spruce, Scotch, silver, and other firs, is supposed by some to be in the latter end of July, or in the following month, when the weather is moist or cloudy.

After the trees have been taken up with care, so as to injure the fibres of the roots as little as possible, and a few of the bruised extremities cut off, they should, when intended to be planted in mixture, be put together in proper proportions, and conveyed in this way to the place where they are to be planted. They must then be distributed on the ground, at the pits or other places, in order to be ready for the planters, as by this means much time is saved, which would otherwise be lost in sorting. But to prevent the roots from getting too dry, it is necessary not to take up, or bring on to the land, more than can be planted in a short space of time. This should invariably be the practice. Where only one or two sorts of trees are however to be planted, the usual practice of carrying the plants along as the planting proceeds may be the most convenient method.

The operation of planting is the best and most expeditiously performed by two persons; a man to do the work, and a boy to hold the plants. In performing the business, the labourer first stirs the mould well in the holes or pits that have been previously prepared, rendering it level, and fit for the reception of the plant; form new holes according to the mode of planting. The boy then places the plant in the hole with all the fibres of its roots regularly spread out and unconfined, to the depth of about an inch more than it had stood in the nursery, holding it perfectly upright; while the man gently fills in the loose mould, moving the tree a little up and down to let it mix with the roots: the remainder of the earth is

\* Nicol on Planting.



afterwards put in ; and then the labourer proceeds to the preparation of the next hole, leaving the boy to set the plant erect and close the mould about it, which in soils of the stiffer sort should be only performed in a light manner, but in those of the drier kinds, as the sandy and gravelly, as close as possible. In this way the work is to proceed till the whole is finished. There are other methods of planting, as by forming flits, nicks, or openings of other kinds, so as just to squeeze in the roots of the plants : but these never succeed well.

Much of the success of the planter depends upon having this part of the work well executed ; but great care should be taken, particularly where the land is inclined to moisture, or of a retentive quality, not to plant at too great a depth. In planting on steeps, it is directed that the trees should be placed towards the declivity, being planted at the lowest part of the opening ; which should, in completing the business, be left the highest, by which the moisture may be better preserved.

It seems not improbable, but that in many cases and situations the planting of small trees of the timber kind might be performed with great convenience and expedition by the assistance of a plough suitable for the purpose, as has been sometimes practised in setting hedge-plants.

In the planting of trees of considerable growth, great attention is necessary to have them well secured against the wind, as, when they become loose, the fibres are so broken and destroyed that they soon die. This has been commonly effected by means of staking : but as in this way the trees are often in danger of being injured by rubbing, a practice of ramming the earth closely about the roots has been attempted, which in some soils, and upon small scales of planting, has it is said been found to succeed ; but in extensive concerns it is wholly inadmissible, from the trouble that must attend it.

When the plants have been all put in, it is a practice with some to sow or set the plantations with acorns, as it is found that sown oaks as well as other trees exceed in growth those that are planted. This work is done either by paring off the surface with a mattock, and setting the acorns with a dibble, or by putting them in short drills by the hoe at the distance of about six inches. The best season for performing this business is in April, and it may be effected the first, second, or third year after planting\* ; but the first or second is probably to be preferred. Great care should be taken to

\* Nicol on Planting ; and Nottingham Report.



preserve the acorns well, by exposure to the air and frequent turning for this purpose, as they are very apt to sprout soon after being gathered \*.

After the trees have been planted, it is necessary not to lose sight of the plantation. The young plants must be kept clean and free from the annoyance and choking of coarse weeds of all kinds, for at least three or four years. This may be effected by the hoe in many cases; but some have recourse to the culture of different sorts of crops in this view. In this method, however, much care is requisite not only to avoid injuring the plants, but to guard against the soil being too much impoverished, and their growth thereby much restricted.

Where coarse plants abound, such as broom, furze, briars, and other similar productions, in all the less exposed situations, they should be wholly cut up and destroyed; but in bleak exposures it may be a better practice to only clear them to a distance round the trees, so as that they cannot do any injury by rubbing or striking against them, the other parts being left for the purpose of sheltering and protecting the young trees.

There is another point not less requisite to be attended to in young plantations, which is that of filling up the vacancies that are caused by the dead plants. Where the ground is kept perfectly clean, this may be done at any proper season; but in other cases, when the dead plants cannot be so easily detected, it may be better to delay the business to the third or fourth year, when the deficiencies can be more perfectly ascertained. If this sort of business be done too early, many plants are frequently removed that would have thrown out from the bottom, on account of their not being dead in that part, though wholly gone in the top.

The plants employed in filling up the plantations should never be too large, as, where that is the case, they are more liable to die.

There is another kind of planting which is frequently practised, but the propriety of which still remains a desideratum. This is that of setting the hedge-rows with trees of the timber kinds. Some contend for the utility of the practice, on the

*\* Quantities per Acre.*

Acorns, four to six strikes.

Ash keys, four strikes.

Spanish chesnuts, one ditto.

Hawthorn berries, one ditto.

It is necessary to bury the ash keys and hawthorn berries one year in beds or pots of sand before they are sown in plantations.



grounds of the degree of shelter and ornament that is afforded, as well as its being a means of raising much useful timber at little or no expense; while others condemn it, as highly improper and disadvantageous, on the principle that much injury is not only done to the crops, especially when of the grain kind, both by the dropping and the spreading of the roots, but also to the hedge in the places where they stand, by their producing gaps and openings. But though some inconvenience and injury may be sustained where this sort of planting is much in use in arable districts; yet from these being in a great measure capable of being obviated by proper training and pruning, and from the naked appearance which is exhibited without them in a country, but more particularly from the vast benefit that may be derived in the way of timber\*; it would seem that some extent of planting in this method should be attempted in most situations. But in performing the business the nature of the land, the sort of husbandry that it is principally conducted under, and the kind of exposure in which it is placed, should be well considered, and the sort of trees properly adapted to it. In dry soils, most sorts of timber trees, as has been seen, may be planted; but in those more stiff and heavy kinds, the oak and the elm may be the most proper. The ash should, perhaps, never be had recourse to where the land is almost wholly under the plough; but on lands under the grazing or grass system, it may be planted with advantage. In bleak and exposed situations, the beech is probably the best for this use; and near the sea the sycamore. The trees where the ground is mostly in an arable state should be planted at much greater distances than under the contrary circumstances, and such trees as run most to tall clear stems be preferred.

The young trees for this sort of planting should be larger than in other cases, being kept in the nursery two years longer than has been advised above, and

\* It has been observed by Mr. Middleton, "that it would not be an easy matter to make an accurate estimate of the advantages to be derived from such a measure; but in order to gain a slight idea as to the quantity of hedge-row timber, let it be considered that, in well-inclosed, hedged, and cultivated districts, the hedge-rows occupy from a twentieth to a tenth of the whole surface. Even including the common fields, and cultivated slopes and borders of sheep-downs, the average quantity of land occupied by hedge-rows at this time amounts to a twentieth, or two millions of acres: *all* of which might, probably, be made to produce timber: more than *half* of it, however, would no doubt do so, by only trimming the lowest side branches off to the height of ten, twelve, or fifteen feet from the ground. This would permit the air to circulate freely; give every advantage to the occupier's crops; and would leave sufficient tops upon the trees for all the purposes of growth and rural ornament. Under management like this, the hedges would every where present healthy, vigorously-growing, and handsome timber; would add very much to the profit of the land-owner; to the security of the country; and to the pleasures of the traveller."



shifted so as to produce more fibrous roots. When about five or six feet in height they are probably in the most suitable condition for being removed into these situations.

The most proper time of planting in hedge rows, is when the fields are first broken up from the state of lay, as at that time, from their being continued in the state of tillage for some years, there will be less trouble and expense in protecting them from cattle by palings, &c. as well as less danger of their being injured by the browsing of live stock, as they will be advanced beyond their reach by the time the land is restored to grass. Where the planting is performed in the hedge-rows of grass lands, the trees must always be perfectly secured from the croppings of cattle, as well as the rubbing of sheep, or other animals, as, where this is not the case, they are soon destroyed.

The planting in these cases should always be carefully performed in the manner that has been already described; and where the trees do not stand perfectly firm against the wind, they should be well secured by stakes, or other proper means, as they never thrive well when not perfectly fast.

The barbarous practice, too frequently made use of in different districts, of converting the hedge-row timber trees into pollards by lopping off their top branches, should in all cases be guarded against as much as possible, as it is the destruction of timber. Where pollards abound, they are mostly cropped once in from about nine to fifteen years, the profit of which mostly belongs to the tenant. This work should be constantly finished by the end of February.

In plantations of timber and other sorts of wood, it is necessary to attend to the proper pruning and thinning of the trees occasionally as they advance in their growth, in order to prevent their growing in an improper manner, and their injuring each other by rubbing or being drawn up weak. In the first view they are therefore to be occasionally looked over after the third season from planting, and such headed down, or otherwise cut, as may appear necessary for their more perfect growth. When this has been done, the only thing further will be to encourage a leader, by shortening all the other branches that appear to contend with it to nearly one third of their length, in order to strengthen the main stem. The whole that is afterwards necessary is that of properly thinning the strong top branches, and those on the sides, which may be done by a light bill. This is applicable to trees of the forest kind; but those of the fir and evergreen sort require nothing more than the regulation of their leaders, as that of keeping them single where they throw out double. The less the side branches are touched the better.



The proper thinning of plantations or woods is a matter of the greatest consequence to the growth of the trees, as where they are too much crowded they are apt to be drawn up weak. In mixed plantations the nurse trees should be first gradually thinned out, beginning with those of the most inferior kinds, few of which should be suffered to remain after ten or fifteen years. In performing this business much must be left to the judgment of the operator and the circumstances of the plantations; but the chief rule is to keep the extremities of all the side branches so as nearly to touch each other, and to have a due regard to the distance of the tops, not the roots of the trees, as some require much more room than others\*.

In the plantations in Nottinghamshire, about the fourth or fifth year after planting, the small-sized birch and seedling oaks are grown to a proper size for transplanting. In the thinning of these, care is had not to take too many away in one season; as by being properly managed a supply of plants for at least half a dozen years is provided. About the same time that the smaller-sized birch wants thinning, the large ones require to have their lower branches taken off, so as to keep them from injuring the oaks: and this is the first profit of the plantations, the birch-wood being readily bought up by the broom-makers. This pruning is continued as often as required, till the birches are grown to a sufficient size to make rails for fencing; they are then cut down, to make room for better trees. By this time the oaks are grown to the height of twelve or fourteen feet, when they draw themselves up exceedingly fast. After the birches are cut down, there is nothing more to do but thinning the oaks from time to time, as requisite, and cutting off their dead branches as frequently as may be necessary. In performing the first, much caution is required; for, if length of timber can but once be obtained, time will bring it into thickness; they are therefore let grow very close together for the first fifty years. In respect to the progress of the oak in two plantations, one of twenty-eight, the other of fifty years growth; in the former the trees were in general about twenty-five or twenty-six feet in height, and in girth about eighteen inches; but in the latter something more than sixty feet in height, and in girth a little above three feet, being in general about fifty feet in the bole. Plantations of the fir kind require less thinning than those of other trees.

The thinning of underwoods must be regulated, in a great measure, by the luxuriance of their growth, and the purposes to which the cuttings are to be applied: when for the larger uses, more thinning will be necessary than in the contrary case.

\* Nicol's Treatise on Planting.



There is another sort of planting which in many situations, such as those of the moist boggy sort on the borders of rivers, is extremely advantageous; this is that of the willow or ozier, for the purpose of the basket makers. The method of planting in these cases, on the banks of the Thames, is thus described in the Transactions of the Society for the Encouragement of Arts, &c.

“The ground is dug during the winter a full spade’s depth, and left rough, to prevent the tides from running it together again before it can be planted.

“The work begins in the month of March. The planter having procured the sets or plants, which are fifteen or sixteen inches long, cut diagonally off the strongest shoots of the last year’s growth, care being taken that they are not cut near to the top of the rods, that part being too porous to make a sound plant, the ground is then marked out into rows two feet asunder; and the sets are stuck in the rows, eighteen inches from each other, leaving about seven inches of the sets above the ground. This work is very easily done, without using even a dibble or a setting-stick; but, when planted, care must be taken, by hoeing, to keep them as free from weeds as possible; or, if the ground be too wet for the hoe, a weeding-hook may be used to keep them down: this is absolutely necessary to ensure a good plantation. It is also equally necessary to keep the ground well drained, to prevent the tides remaining upon it any considerable time, for on that also depends the firmness and good quality of the rods.

“The willows are cut over the first year with a bill-hook; the shoots are cut off close to the stock, and bound up in bundles, or *boult*s, as they are called, which measure forty-two inches round, at sixteen inches above the butt ends. The same process of weeding must be pursued every summer, while they are shooting up from the stem. The next cutting season a portion of them is left to stand another year, where large stuff is wanted for the ribs of large baskets, &c.

“The planting of willows is expensive the first year; but if well managed they produce a great profit, as they improve in quantity every year\*.”

As the demands for this sort of produce are very great, wherever the farmer has lands that are suitable for this kind of culture they should not be neglected. On

\* The names and uses of the species employed in the vicinity of Brentford are thus described:

“1st. The *salix vitallina*, or yellow willow, which is cultivated chiefly by the nurserymen, and being of a tough yielding nature, is used for binding packages of trees and shrubs in the drawing season, and for tying up the branches of wall and espalier trees.

“2d. The *salix amygdalina*, or almond-leaved willow, is a species of which there are several varieties, one of which is called by the planters “the small red willow,” or “binding rod;” it being chiefly used.



such moist boggy soils the cultivation of the Huntingdonshire willow has also been found extremely profitable when grown for the purpose of hop-poles\*.

*Management of Woods.*—It is always a convenience, and in many cases and situations a very profitable thing, to have woods for the purpose of cutting for the use of the farm, or with the view of sale; but in either intention it is absolutely necessary that they be kept in a good state of preservation from the destructive browsing or croppings of cattle, by proper fences, and well stocked with the most useful sorts of wood that are capable of being grown to advantage on the peculiar soil and situation, as, without due attention in these respects, from most of the stocks that afford the wood “being in fact only pollard trees growing under ground, it is obvious that the produce of such stocks must, like the shoots of pollard trees, be the most abundant when the parent stocks are in the greatest perfection; that until they attain that perfection, it must be small; and that, when past that perfection, they gradually decline; the shoots from them become weaker and fewer every successive cutting, and the stocks finally decay and die. To prevent the decay of woods, it is necessary of course, from time to time, to renew them by raising new stocks to supply the place of those which gradually wear out or are destroyed. But besides the regular decay of age, to which all woods are liable, there are other injuries to which they are exposed, and which speedily and prematurely bring on their decay, unless prevented by proper means. One is the pernicious custom of suffering cattle to feed in woods, under an idea that, after they are of a certain age, as seven years, the shoots are grown out of the way, and cannot be hurt. In strong thriving woods, it is possible that cattle may do but little harm to the underwood, after it is seven or

for binding the produce of garden-grounds. Another kind of this willow is at present known by the loose appellation of the “new kind;” it is of large growth, and produces a great crop; is used both by the basket-makers and the corn sieve-makers, and is fit for any work which requires a firm as well as a tough rod.

“3d. The *salix viminalis*, or ozier willow—Of this species there are also several varieties, which are called among the planters by the name of “the yellow and brown oziers, or, “Comb’s oziers.” They are chiefly used by the basket-makers, being very pleasant working rods, and, as they produce a great crop, are much cultivated.

“These three descriptions comprehend the most useful varieties, and are the most profitable in point of crop, of any that are cultivated in this district. There is, however, a coarse sort of willow, known by the name of “the Spaniard;” but whether it is a distinct species or not is not decided; it might be rendered extremely useful in counties where much brush or underwood is bound.”

\* Corrected Report of Nottinghamshire.



eight years old; but all the young plants, which either spring up spontaneously or are planted in them, must be liable to be cropped and kept down, and few of them can come to perfection. And in weak decaying woods, there is always a great deal of the underwood so low as never to get out of the reach of cattle, but constantly liable to be cropt and kept down by them, and the decay of the stocks consequently much hastened. Another cause of the early decay of woods, is the want of draining such parts of them as are subject to be moist and damp; nothing being so prejudicial to wood as too much wet. This begins to be well understood in most draining districts, and has been practised with success. A third cause of decay, is the custom of suffering woods to grow too old before cutting; whereby the strong shoots smother the weak ones, and, by their dropping, kill the stocks on which they grow. And to this may be added the practice of permitting the buyer to cut the wood, thereby making it his interest to destroy every sapling, and to cut the underwood as close to the stock as possible—which in old woods is highly prejudicial to the succeeding shoots—as well as the custom of not obliging the buyers to clear the woods early in the summer, so as to prevent the new shoots from being injured by their cattle, carriages, and other circumstances\*.

In forming or improving woods of the coppice or underwood kinds, it is particularly necessary to pay attention to the nature of the soil as well as that of the aspect; and to adapt the trees and plants to the nature of these as much as possible, at the same time taking into the consideration the kinds that are most useful and most in request in the district or immediate vicinity, as from its bulky nature it is in general the most profitable when disposed of without the trouble of much carriage. Various sorts of plants and trees, as has been seen above, may be employed in this way, according to the state of the soil; but it has been observed that “taking the general demand of countries, and the peculiarities of different soils, into consideration, there is no kind of wood so generally proper for planting in this way as ash. The value of ash-poles being at least one-third more, and frequently as much again, per hundred weight, as that of other poles (being applicable at all sizes to some useful purpose or other); the timber being always in request, and saleable at any age or size, at almost the price of oak; and the wood itself being as quick a grower as any, and quicker than most; and above all, there being but few soils, from the blackest and wettest bogs to the highest and most exposed mountains, where

\* Davis in Bath Papers.



it will not grow; are reasons why ash is one of the most profitable woods to plant in such coppices as are favourable to its growth. But in soils and situations where ash does not grow kindly, let such other sorts of woods be planted as appear to thrive best in similar soils and situations in the same country. Spanish chestnut, though not so general a grower as ash, is a most excellent wood, either for timber or underwood, and wants only to be more known to be higher in estimation. It partakes much of the properties of oak, but excels it in two points, viz. that it grows faster, and that the sap part of the timber is firmer and less corruptible\*.”

If it be profitable to plant new woods, it is certainly much more so to protect those that are already planted, to fill them up where thin, and to restore them when in a state of decline. The expense in this way is not only lessened by the saving of new fences, but the profit is greatly increased, by the rapid growth of the wood, when planted in situations that are sheltered by other trees and plants already planted. In woods where saplings rise in great numbers spontaneously, their growth should be encouraged. As, at the time of cutting the underwood, such saplings may, perhaps, be 14 or 15 years old; it might appear proper, after leaving for timber trees such as are straight and handsome, to cut off the rest for underwood; but a great part of the saplings at that age so cut off will not be large enough to produce shoots sufficiently strong to get up as fast as the other underwood. These shoots would therefore suffer, and the stocks never come to perfection. It is consequently, in general, more advisable not to cut off such saplings as are intended for underwood, until the second cutting of the wood, when they may be probably near 30 years old, and will then throw out shoots strong enough to fight their way, and keep pace with the surrounding underwood. But where saplings do not spring up in abundance in this way, young trees must be planted; part of which may be preserved for timber, and the rest left to be stubbed off for underwood at a proper time†.

For the purpose of filling up such woods as are “grown thin by age or neglect, the proper time is one year, or at the utmost two years, after the underwood is cut. The young plants should be eight or ten feet high, and an inch and a half in diameter at the ground, and should be planted without cutting off. If the soil be dry, no other preparation is necessary than barely digging the holes for the plants. If wet, deep drains should be made to take off the superabundant water. The

\* Davis in Bath Papers.

† Ibid,



earth dug from these drains being thrown out on the lower side of them, upon this new earth the plants should be planted. If land of this latter description be black and peaty, ash is peculiarly proper for it; and will, if planted on the earth thrown from the drains, make a most surprising progress. If it be a stiff yellow clay, it is generally more favourable to the growth of oak than of ash. In such soils, oak for timber, with a mixture of willow, birch, alder, and Spanish chestnut for underwood, will perhaps be the most proper. All these kinds should stand one round of the underwood, and, if still weak, should stand two, before those are cut off which are intended for underwood. Birch plants however are an exception to this rule: they should always be cut off the first round of the underwood; for, if they are large when cut off, the stocks frequently decay and die. In all mixtures of kinds of wood for coppices, those sorts should be used which are not unfriendly to each other, and which will come round fit to be cut together at the same periods; and such kinds should be allowed to stand for timber, and that at such distances as to injure the underwood as little as possible. The plants for filling up old decayed woods should be the strongest and best of their kinds; and those which are weak at first will be drawn up by the surrounding underwood, and become from their increased height still weaker. At the next cutting of the underwood, they will be blown down; or, if cut off, the shoots will be too weak to grow up with the other underwood. Oak, ash, and Spanish chestnut should be kept in a nursery for this purpose: alder and birch plants grow plentifully spontaneously in some countries, and may be taken up for use. Alder is sometimes propagated by taking up old roots and dividing them into several parts; and hazel may be raised in the same way. Willow is generally planted in cuttings; but a much better way, where there are any old willow stocks, is to plash down the shoots to fill up the vacant places round such old stocks\*."

It is a question which has not yet been fully decided, and which can only be well ascertained by trials made upon a number of poles or stems of different sorts of wood at different growths, as seven, fourteen, and twenty-four years, to see whether the increase is in proportion to the length of growth. In this way, proper attention being paid to the nature of the soil by nice observation, in time a correct and useful estimate might be obtained of the most advantageous periods of cutting woods. The practice of cutting differs in different districts, from seven or eight to twenty-five or thirty years; but the most common is probably from

\* Davis in Bath Papers.



twelve to fourteen or eighteen. There is also a practice in some wood counties of leaving one or two stems upon each stool for a double growth, by which a portion of large wood may be procured in each fall. In this way it is probable that there may not be a much less increase in the growth of the other parts of the wood, while the largeness of these stems may afford more profit, and admit of being applied more generally and to more important uses. If there are causes that cannot be obviated, so as to prevent cattle from injuring the early growth of woods, it must obviously be the most profitable method to defer the cutting to as late a period as possible, from the mischief being chiefly in the first few years. For many uses it is impossible to cut at the more early periods, except on very good soils indeed. This is the case with ash and oak, for hop-poles, and some other sorts. On the whole, it seems therefore probable, that the most profitable method may in general be to defer cutting till the later periods.

In the extensive woods of Buckinghamshire, where the produce is chiefly beech, it is the practice not to cut till from twenty-five to thirty, or even thirty-five years, by which means they consist almost wholly of successions of young trees. In the cutting, the trees of a proper age are annually singled out and cut, without having recourse to regular falls, as in other cases. The extent of the cuttings is made so as to pay the proprietor from about fifteen to twenty shillings the acre, in proportion to the goodness of the growth. The best afford a clear profit of twenty shillings under this management\*. In Worcestershire, where the woods are chiefly cut for the sake of the bark, they are felled at about forty years growth, a proper quantity of store woods of fourteen and twenty-eight years growth being left for the next fall. And in the neighbouring district of Hereford it is sometimes the case to fell at from eighteen to twenty years growth, and in others at from twelve to fourteen or fifteen. In the former it is chiefly oak; but in the latter case ash, sallows, and alder. The whole is cut, and such parts as are proper applied as hop-poles, with much profit. The twenty years falls are stored and applied in the usual manner. In cutting-wood one *maden* standard is left to each *lugg*, or forty-nine square yards. Coppice-wood will produce at from 2s. 6d. to 4s. 6d. a *lugg*, from twelve to twenty-two pounds the acre, at from twelve to fourteen years growth, which is a greater return than could be obtained in almost any other way in such soils and situations†.

The Dillorn woods in Staffordshire “form a chain of three or four miles in length, and consist of tall straight oaks and ash, which are in general so well filled up with

\* Buckinghamshire 4to Report.

† Herefordshire 4to Report.



underwood as to be cut, in gradual falls at seven years' growth, and produce when well fenced six pounds per acre; for rods and staves, used for crates in the neighbouring pottery. Eighty-four acres of wood will admit of twelve acres being cut annually, and will produce seventy-two pounds; which is about seventeen shillings per acre per annum for the underwood, exclusive of the timber; while the bleak neighbouring hills which remain unplanted are not supposed worth more than three shillings per acre\*."

It has been suggested by Mr. Davis, that "the periods of cutting underwood should be regulated by the luxuriance of its growth, the demand of the country, and the uses to which the wood is to be applied when cut. In the article of underwood, not only the interest of money, but the loss of the succeeding growth, tell against the value of standing wood after it is fit to cut, and make it doubly the advantage of the owner to cut his underwood as early as it is saleable. As soon, therefore, as any kind of wood is fit for the uses of the country, it should then be cut, unless it can be made appear that it will pay compound interest for standing longer, or, in other words, will pay not only the simple interest of the first value, but also the loss of so many years growth of the wood, as so far advanced towards another crop. Wood merely for fuel can scarcely be cut too young. Hazel is usually fit for hurdles and dead hedges, from nine to twelve years old; ash for sheep cribs, at the same age; and ash and other woods, for hop-poles, from eleven to fourteen years old: while ash for carpenters and other large uses, alder, birch, and willows for rafters, turners' uses, pattens, clogs, and coalpit uses, should stand from sixteen to twenty years before the poles are large enough for their respective purposes."

The business of cutting wood usually commences in November, and may be carried on through the winter months till February or March; but should be completed before the beginning of April, except where the wood is to be barked; in which case the beginning of May may be the most proper, as it will then generally run the best.

Opinions have differed much, Mr. Davis observes, "respecting the most proper time of the year for cutting underwood; but there is one rule which, on the seller's part, is without exception, viz. that the older the wood is, the later in the spring it should be cut. When old wood is cut early in the winter, and a hard winter follows, the damage done to the stocks is very great; young flourishing wood will bear cutting at any proper season. But on the part of the buyer it is allowed that all woods are more durable, when cut in the most stagnant state of the sap; and in all



uses where bending is required, such as hurdles, hoops, and even dead hedges, the wood cannot be cut too early in the winter, being, if cut when the sap is rising, brittle, and unfit for those purposes." Oak underwood, as bark fells at present, may pay well for standing till the sap is up for barking, and the stocks will seldom be much hurt by the practice.

The work of cutting wood is mostly performed by measure, or what is sometimes termed tale. The wood is differently managed in different districts; in some it is merely cut and laid in rows or drifts, being disposed of in that state by the rood or other measure. In other cases it is regulated according to its uses, being sorted by the farmer into hop-poles, hoop-stuff, hurdles, faggots, stakes and edders, &c. which is probably the most advantageous practice; but the farmer should be cautious in listening to the advice of workmen on these occasions, as they mostly suggest that method which will be the most beneficial to themselves.



# PRACTICAL AGRICULTURE,

## SECTION XIII.

### Live Stock.

**LIVE STOCK**—Importance of—Great Attention to—Further Improvement of necessary—Additional Facts and Experiments wanting for—Circumstances to be attended to in—Shelter and Warmth with a high Degree of Fertility of Pasture useful—Systems of Practice pursued in, different—Crossing the Breeds—Supposed Advantages and Disadvantages of—Though useful, should be practised with Caution—Injury easily done by it when injudiciously performed—Various Proofs of—Breeding in-and-in—Advantages of this Method—What necessary to be regarded in—Principal Object of the Farmer in, Profit—Form of Animal most proper for—Properties to be regarded in—Shape—What necessary in—Most perfect Kind of—Which most advantageous in the View of the Grazier—The most perfect probably best—Size—Question concerning not fully settled—Opinions differ from the Quantity of Food consumed not being well ascertained in—A Number of small Animals consume less than of large ones—Mr. Knight's Opinion favourable to large Size for fattening—Consumption of Food not in proportion to Size—Advantages of small-sized Animals—Smaller Sizes best for Milk—Reasons of stated—Sizes of must be much regulated by Pasture or Herbage—On rich Pastures large Breeds most profitable—On inferior ones, the smaller Sorts—Tameness of Disposition—Great Utility of in domestic Animals—Hardiness a desirable Property in—Marks of—Early Maturity—Advantages of to the Farmer—Circumstances most favourable to—Good Feeding and Warmth while young—Quality of Flesh—Probably depends on Breed, and not on Size of Animal—Goodness of Flavour in some measure on Food—Badness of Colour, perhaps morbid—Appearances of good Meat—Effects of Difference of Age on—Disposition to fatten—highly necessary to be attended to—Principle of not fully investigated—Much influenced by Form and Breed in Mr. Bakewell's Practice—Advantages and Disadvantages of too much fattening—Fattening the only Mean of producing good lean Meat—Much Attention to this Property necessary in raising Live Stock—Hide—Necessary Fee! of—Utility of in exposed Situations—Property of supplying Milk largely—Nature of Animals for—Should probably be an exclusive Breed for—Sir John Sinclair's Opinion of a Breed suited for this Purpose and that of the Grazier's—Aptitude for Labour—a Property necessary in certain Circumstances—What proper to be considered in—Blood or inherent Quality of a Breed—Utility and Advantages of in breeding Animals—Much Regard necessary to all these Properties in Breeding—Modes of conducting the Business—Success of, on what depends—Choice of Live Stock—Various Circumstances to be considered in—Vast Advantage of improving Live Stock shown—**NEAT CATTLE**—Breeds of very numerous—No perfect Arrangement of—Methods that have been attempted in—By the Horns—By the Names of the Counties or Districts where they prevail most—Different Breeds of described—Long-horned—Middle-horned—Short-horned—Welch Breed—Suffolk Dun Breed—Polled or Galloway Breed—Kiloe Breed—Fifeshire Breed—Alderney Breed—Wild Breed—Nature and Properties of each explained—Different Breeds proper for different Purposes of the Farmer—Circumstances to be regarded in this Intention—Cow-Stock—Means of providing good Sorts of—Breeding and rearing young Stock—What necessary in—Farms proper for—Best Methods of in different Circumstances—Kinds of Food most advantageous for—Winter Management of—Manner of foddering of—Question of being tied up or loose considered—Summer Pasture for—Proper Age of putting Heifers to the Bull—Time of—Best Season for Calving—In Calf-Stock should be well fed—Bulls—Duration of Vigour of—Should be well supplied with Food in rearing of—Bakewell's Practice in—Oxen for Labour—Proper Management of, in Herefordshire and Devonshire Kinds—Time of bringing into Work—Best Modes of shoeing of—Age of Cattle how ascertained—Diseases of—Scourings—Yellows—Bloody Urine—Foul—Wounds—Remedies proper for—**SHEEP**—Importance of in different Views—Nature of in different Kinds—Distinguished into different Classes or Breeds in different Ways—According to the Nature of their Wool—The Situations in which they are chiefly found—Their particular Properties—Standard Form of in the Ram—Attention necessary to this and other Properties in Improvement of—Different Breeds of described—New Leicester or Dishley Breed—Lincolnshire Breed—Tees-water Breed—Romney Marsh Breed—Dartmoor Breed—Exmoor Breed—Dorsetshire



Breed—Herefordshire Breed—South Down Breed—Norfolk Breed—Heath Breed—Herdwick Breed—Cheviot Breed—Dunfaced Breed—Shetland Breed—Merino or Spanish Breed—Nature and Qualities of each explained—What Breeds most suitable under different Circumstances of Soil, Climate, and Situation—With the Intention of Profit from the Carcase—From the Wool—Mr. Marshall's Opinion of different Breeds in respect to different Manufactures—Circumstances to be regarded in Introduction of—Fine Wool may be obtained without Injury to the Mutton—Putting Rams to Ewes—Proper Time for—Proper Selection of Ewes for—Late Duke of Bedford's Practice in—Best Age for—Necessary System of Management of Sheep in different Circumstances—In Winter—Proper Keep while in Lamb—Great Attention to necessary at Lambing-time—Necessary Provision of Food for—Utility of Turnips in this Way—Modes of eating of with most Advantage—Lands much improved by—In good Breeds Bran and Oil Cake useful—Baiting with Hay necessary—Cotting—Great Utility of—Brought through Winter well in this Way—Preserved Grass—Vast Benefit of for this Use in early Spring—Watered Meadows may be depended on where sufficiently extensive—Other Means of Support of—Turnip Shoots—Rye-grass and Clover, Mr. Young's Opinion of these—Cabbages better in April—Turnip, Cabbage, Rutabaga—Boorcole—Importance of—Burnet, great Use of at this Season—In Summer—Turning upon the Pastures—What necessary in—Best Methods of—Attention to the Fly necessary—Weaning the Lambs—Best Modes of—Proper Feed should be provided for—Ewes to be kept at a distance—Advantages of dividing Flocks into different Parcels—Practice of by Mr. Boys—Management in Down and Mountain Sheep—Salving or Smearing—Inutility of the Practice—Profit of Sheep in various Cases—In Mr. Macro's Estimates—In Mr. Ellman's—In the Duke of Grafton's—Folding—Mr. Young's Objections to in certain Cases—Cause of Practice of—Advantage of, in Sheep-yards—On Tillage Lands—Summer Management of Stock Sheep—Best Method of washing—Proper Time and Method for—Shearing Sheep—Circular Method of an Improvement—Origin of—Introduction of by the Earl of Egremont—Late Duke of Bedford—Mr. Coke—Management in—Expenses of—Winding the Wool—Frequent Clipping—Effects of—Clothing Sheep—Effects of not fully shown—Time of clipping Lambs—Of castrating them—Directions respecting setting Lamb Stock—What necessary in the Annual Purchase of Sheep where Stock Sheep are not kept—Produce in Wool different in different Breeds—Qualities of adjusted by Woolstaplers—Qualities necessary for Shepherds—Modes of determining Age of—DISEASES OF—Fly—Foot-rot—Scab—Rubbings—Blindness—Rot—Turn or Giddy—Resp or Red-water—Braxy—Black-water—Skit—Causes and Nature of these Disorders—Methods of Cure—Common Salt—Its Uses in preventing Diseases in Sheep.—HORSES—Utility and Advantages of in different Views—Breeds of, employed in the Business of Husbandry—Different Breeds of described—Blood Horse too fine—Cleveland Bays—Suffolk Punches—Clydesdale Horses—Heavy Blacks—Welch and Scotch Horses—Properties and Advantages of each explained—Farm-Horses should be selected from the three first Kinds—Heavy Kinds less used, from the Introduction of the Blood Sort—Breeding of can only be attempted under certain Circumstances—Method of Management in—Time of putting Mares to the Horse—Importance of having Foals early—Time of going with Foal—Should be well kept during—Care to be taken in working of—Modes of rearing the Foals—System pursued where Breeding is not practised—Time and Method of castrating—Practice in Yorkshire—Mode of breaking of—Making up young Horses for Sale—Question of the comparative Utility of Horses and Oxen as Teams—Cases in which each Kind may be useful—Best Methods of feeding Teams—Means of lessening Expense of keeping of—Various Estimates of—Utility of bruising Oats in—Barley may be employed with Advantage in—Feeding Ox-Teams—Working of Teams—What useful in—Different Utility of the Stable and Shed System—Expenses of keeping Teams differ much—Necessary Proportion of Teams to the Extent of Land in different Sorts of Farms—Ass and Mule Teams—Where useful—Diseases of Horses—Wounds—Bruises—Strains—Warble Tumors—Colds—Colics—Staggers—Strangles—Worms—Bots—Farcy—Grease—Mange—Descriptions and Nature of each—Methods of Cure in—SWINE—Proper Form of—Large Breeds of—Berkshire—Hampshire—Shropshire—Gloucestershire—Herefordshire—Different Properties of—Large Breeds should be attended to—Small Breeds of—Chinese—White, Swing-tailed—Different Qualities of—What necessary in the breeding of—Utility of convenient Sties—Circular Form of advised by Mr. Young—Advantages of—Expense of building of—Age of putting to Boar—Produce of—Best Seasons for rearing—Different Sorts should be kept



*separate—Proper Sorts of Food to be provided in Abundance—Crops proper for in this View—Proper Proportions of—Modes of feeding different Sorts of—With Dairy-wash—Other Sorts of Wash—Pea Soup—Boiled and other Roots, Cabbages, &c.—More Sows capable of being kept in this Management than under the Dairy System—Advantages of rearing Pigs only twice in the Year in this Mode—Soiling Hogs more beneficial—Lettuces useful for Sows with Pigs—Mode of cultivating them for—Expense of Store keeping of various—Best Periods of selling in this Management—Advantages of breeding and rearing Pigs—Fattening—Seasons for—Substances employed in—Best Means of employing them—Advantage of different Sorts of Food in the Production of Pork—Pigs pay for Keep equally well as other Sorts of Stock—Modes of curing Bacon, Pork, and Hams—Diseases of Hogs—Mange—Cracks in Ears—Swellings in Udders—Proper Remedies for—RABBITS—Where kept with Advantage—Proper Breeds of for Warrens—Methods of managing of—Statements of Profit of—Modes of taking by Nets and Traps—POULTRY—Where usefully kept—FOWLS—Different Breeds of—Proper Conveniences for—Management of in setting, breeding, rearing, and fattening of—Expenses of—Mrs. Boys's System of Management of—Diseases of—GUINEA Fowl—Uses of—TURKEY—Breeds of—Proper Management of—Reason of Fineness of in Norfolk—Living and Dead Weights of—Water Fowl—DUCKS—Kinds of—Best Modes of Management of—Utility of in destroying Worms, Slugs, &c. on Grain Crops—GEESSE—Kinds of—Proper Modes of hatching and rearing of—Manner of plucking of—Methods of fattening of—PIGEONS—Where kept with Advantage—Proper Sorts of—Best Management of—Dove-cotes should be kept clean and free from Vermin—BEES—May be kept with Advantage in some Cases—Most proper Situations for—Methods of purchasing Stocks of—Best Construction of Hives for—Profits of—FISH-PONDS—Advantageous in some Cases—Methods of constructing of—Expenses of—Manner of stocking of in different Cases—With Carp—Tench, Perch, &c.—Profits of under different Circumstances.*

**W**HATEVER superiority of attention may formerly have been bestowed upon other branches of husbandry, there is scarcely any that is of more importance to the farmer, or which of late has undergone more improvement, than that of Live Stock. It was indeed to be expected, that in proportion as the means of its support became better understood and more abundantly cultivated, useful changes and improvements would take place in the nature, quality and breeds of the different animals that were to be kept, and of course a double advantage be obtained by the farmer in the improvement of his land as well as stock. There is another circumstance that has also had considerable influence in promoting the increase and improvement of live stock, which is that of the vastly increased demand for the animals, either in consequence of their great usefulness in performing different sorts of labour, or for the purpose of human food.

But though much has been effected in different situations in bringing different kinds of live stock to a higher state of perfection, much still remains to be accomplished. It is probably, in general, far from having attained that state to which it is capable of being carried, by those farmers who have the knowledge of combining the best and most appropriate breeds of cattle and other animals, with their improvements in the cultivation of herbage, or the raising of other sorts of green food for their support. But to enter fully into the nature and explanation of the best and



most certain modes of effecting such improvements in all sorts of live stock, a much larger collection of facts would seem to be necessary than has yet been made, as well as a vast number of additional experiments. In the present state of our knowledge on the subject, it is perhaps only possible to afford a few hints and directions that may be useful in guiding the attention of the farmer.

It has been well remarked, that whenever it is meant to attempt any considerable improvement, in the nature of the live stock of a farm, care should be previously taken that there is a sufficient degree of shelter, shade and warmth, as well as a high degree of fertility of the land, and a suitable state of drainage, as it is only by the richness and abundance of food that such changes can be effected in the most advantageous way, or the stock be brought to any high degree of perfection\*.

In the business of improving different kinds of live stock, two different systems have been chiefly pursued. The first, or that which has prevailed for the greatest length of time, is by means of crossing the various breeds, so as to supply the faults or defects of the one by the merits or perfections of the other: the latter, or that which has been more recently introduced and brought to the attention of the farmer, is by uniting the perfections of the same kind, by continuing to breed from the best and most perfect animals in the same line, family or blood.

It was supposed for a great length of time, and is still by some, that the former of these methods, besides its superiority in other respects, possessed considerable advantages in preventing the animals from becoming small, tender, and liable to disease, in consequence of their being too near akin. This notion has however been shown to have little or no foundation in truth, by the great success which has attended the contrary method, in the practice of one of the most intelligent and expert breeders that this or perhaps any other country has produced†; as his best stock has been raised by the nearest affinities, not only without either diminishing in size, becoming less hardy, or being more subject to disease; but on the contrary with a continued amelioration and improvement‡. And a still more conclusive proof is, perhaps, afforded in such breeds of cattle as have remained for many centuries in the state of nature, in particular situations, without any mixture of others; as in such cases, though from their unrestrained condition they must, without doubt, have bred in all the different possible degrees of affinity; they have been found to continue without any diminution either in their size, hardiness, or health, and without undergoing any injurious alteration in their form, or change in their colour, or other peculia-

\* Middleton's Report of Middlesex.

† Mr. Bakewell.

‡ Culley on Live Stock.



rities\*. But in opposition to these strong proofs, it is still contended by others, though confessedly without any very great experience, that in this method “young stock decrease rapidly in size on the same pasture,” without any “other ill or good effect taking place in consequence of it†. It is likewise further observed, in contradiction of the same opinion, that in proportion as an animal decreases in size, it may be reasonably supposed to decrease in vigour and activity; but that, how far this may render it capable of feeding or living on less food is not ascertained. There is no doubt, however, it is said, but that very beautiful animals may be produced by breeding in-and-in, as “the young animal comes into the world on a small scale; but by keeping it fat from the first moment of its existence, it is made to attain a greater size than nature intended, and its weight will in consequence be very great in proportion to the size of its bones. But this is far, it is supposed, from proving that the practice is eligible‡.” And it is still further contended in regard to cattle, that, as in this system of breeding no expense is spared in feeding the young stock, the breed should of course have attained a larger size: yet they are not only less, but, it is asserted, “carry less fat on their best points than the Herefordshire cattle,” which from the first year are kept in a much inferior manner§.

The effects of the same method in the dog have been found in some degree similar; “the breed has become less in size, but not less keen or active; and by crossing again with a breed of no larger size, it has attained its former weight||.” It is likewise added, that “some experiments of crossing the breeds of plants have thoroughly convinced the writer, “that in the vegetable as well as the animal world the offspring of a male and female not related, will possess more strength and vigour than when they are both of one family¶.” It is not however supposed “that crossing dissimilar breeds of cattle has ever a good effect; as the breeds mix without assimilating. When the long-horned breed of cattle has been crossed with the Herefordshire, some of the offspring have followed one breed, and some the other, and some presented an awkward mixture of both\*\*.”

In this state of the facts, no certain conclusions can therefore be drawn. The safest plan is, probably, to have recourse to both methods, according to the nature of the improvement that may be required; and as there is no possible means yet discovered of rendering accidental varieties, in either the animal or vegetable kingdom, permanent, the best way is constantly to breed from the best and most perfect animals of their kind.

\* Culley on Live Stock.

† Knight in Communications to the Board, Vol. II.

‡ Ibid.

§ Ibid.

|| Ibid.

¶ Ibid.

\*\* Ibid.



It is indeed obvious, that in the crossing method of breeding, though it must be allowed to be extremely useful in many respects, the greatest care and circumspection should be employed to adapt the animals in the most perfect manner to the nature of the improvement which is required; otherwise the breed may be in danger of sustaining injury instead of advantage. From the vague and random manner, indeed, in which attempts to improve the breeds of live stock, on this principle, have in general been conducted, it would seem not improbable but that disadvantage may often have been produced by bringing together such breeds, as, from the great differences in their forms, qualities, and other properties, could have little or no chance of effecting the purpose of improvement in any useful manner. The agricultural surveys of most of those districts where breeding or grazing has been carried to any extent, almost uniformly complain, that useful breeds of live stock have been injured and debased by the practice of crossing injudiciously conducted. And a late writer, in speaking of sheep, has well observed, "that to the mountebank doctrines of crossing dissimilar breeds, which Nature in its infinite wisdom had set asunder, we are indebted for much confusion and mismanagement\*." But it must notwithstanding be allowed, that by crossing, when conducted with sufficient judgment, improvement may in a great measure be effected, especially in what relates to bone or size, the hide or coat, the bettering of particular points or parts, and perhaps in what regards the movement or speed of the animal: but in other views it would seem incapable of producing those beneficial effects which should constantly direct the steps of the breeder.

As it is in some measure a principle founded in physiological science, and countenanced by the observation and experience of ages, that animals are somewhat endowed with the faculty of not only propagating an offspring that has in a considerable degree the properties, dispositions, and resemblance of themselves, but that is in some measure subject to a similarity of disease; it would appear that, although there may be occasional deviations, the most certain method, and that which has the best foundation in the nature and economy of the animals, (in so far as the particular qualities and other properties, besides those that have been just mentioned, are concerned,) is to breed in the same *line*, perhaps in the same family†; as, by a careful procedure in this way, the expert breeder may not only have the greatest security for attaining that improvement which he is anxious to produce, but run the least risk of deterioration.

\* Lord Somerville's System of the Board of Agriculture.

† In the technical language of the breeder, this has been termed breeding *in-and-in*.



The success of the practice has indeed not merely been shown in the breeding of the farmer's stock, but in that of the sportsman. It has been found that pointers and game-cocks have been bred with the greatest perfection and superiority in this mode\*. And it is by the same means that the valuable properties of the race-horse are perpetuated and preserved. The same thing likewise takes place in the vegetable economy, the finest and most perfect productions of the sort being propagated by sowing seed selected from the best and most perfect plants of the same kind, and taking the buds or offsets from the best and most perfect trees of the same species.

There is also another circumstance that seems to show the propriety and superior advantage of this method of proceeding in the breeding of domestic animals; which is, that however much the breeds of live stock may be altered by climate, pasture, and other causes, in what respects their colour, and other trifling particulars, their specific characters remain invariably the same. No causes of these kinds have ever been capable of changing any one of the distinct breeds, whether of neat cattle, sheep, horses, or hogs, in such a manner as to have the characteristic distinctions of those of any of the others. It would therefore appear, that by having recourse to occasional crossing in the above intentions, and the careful selection of the most perfect animals of the same breed or kind, with due attention to constant good feeding, the improvement of live stock may be carried to the greatest perfection.

As the principal object of the breeding farmer must constantly be that of obtaining such animals as will afford him the largest profit; it may be necessary to ascertain the nature and form of animal that may be most advantageous in this view, or which pays the best for the consumption of its food; as by this means it will be seen what points are the most desirable or useful in a breed or variety, and what circumstances ought to be attended to, so as to justify its introduction in preference to another.

The properties that would seem more particularly to deserve the attention of the farmer, in his different views and schemes of improving the breeds of live stock, may be considered under the different heads of *shape, size, disposition, hardiness, quick maturity, nature of flesh, fattening property, milk, hide, aptitude for labour*, and what may be termed the quality of the breed, or, in the language of the art, *blood*.

In respect to the first, the ideas or opinions of breeders have differed very materially; but it is obvious, that there can only be one true or perfect form, which

\* Culley on Live Stock.



must be that which approaches the nearest to exactness in the shape and proportion of the different parts. Whenever this is met with, it indicates the true form, and is that which ought to be aimed at by the breeder, whatever the nature or breed of the animal may be.

In this view, a perfectly formed animal should have an exact proportion and consistency in all the different parts; the head neat and compactly formed, but neither too large or of too great a length; the eyes bright and prominent; the neck not of too great length, but somewhat thin, gradually narrowing from the breast towards the head, to which it should be neatly attached; the chest round, wide, full, and of deep girth; the length of the legs well proportioned to the size; the fore ones straight and clean, the hind ones forming an angle at the hock, so as to stand well under the loins; the distance between the feet in the different extremities equal; the feet round and even, the hoofs straight; the back and loins straight and broad; the belly firm and capacious; the quarters deep, full, and well fleshed downwards.

It is, however, difficult to convey any very correct idea of shape by words; but that which comes up in some measure to this standard would seem to constitute that "utility of form" which has been the great object of modern breeders. And it is probable that such a form is the best calculated for the chief object of the farmer, which is that of receiving and supporting flesh in the practice of fattening; as, where animals much exceed or fall short of such correct proportions of parts, there must be inconvenience or disadvantage, either in their being weak and less disposed to fatten,—of course requiring more food and a greater length of time for accomplishing the business,—or in their being deficient in the general weight and value of the meat, from their not fattening sufficiently on the best parts. It has been observed to have been the constant principle of a most intelligent breeder\*, to procure such animals, whether of the cattle or sheep kind, as were capable of weighing the "most in the most valuable joints," as there is a great difference between an ox of fifty stone, carrying thirty in roasting pieces, and twenty in coarse boiling ones,—and another carrying thirty in the latter, and twenty in the former†. It must undoubtedly be an object of great importance, to have those parts which are of but little value, as small and of as little weight as possible. It may also be advantageous in particular cases, to attend to the nature of the consumption in the shape of the animals, in the manner that has been just seen, as, where some parts are

\* Mr. Bakewell,

† Young's *Eastern Tour*, Vol. I.



more in demand than others, and consequently sell at much higher prices, that shape which is most favourable for this purpose should be more attended to.

It is probable, however, that it is on the just proportion and symmetry of parts in the animals that are employed for the purpose of the breeder, that improvement in this as well as other important points must depend. And of course it seems not improbable, but that the excellence of the most valuable points in all the different sorts of stock may in some degree bear a proportion to the goodness of the form in the animals.

That fine fullness of shape which has been distinguished by breeders under the term "beauty of form," has been considered as distinct from that of "utility of form," and to consist in a more perfect rounding of the parts, and a less appearance of bony protuberance. But though it must constantly be a very desirable object to bring the shape of the animals as near perfection as the difficult nature of the business will admit, yet utility, or what may in other words be termed profit, must be principally considered, as being the immediate object of the stock-farmer.

In the size of animals there is a variety which admirably adapts them to the variations of soil, climate, situation, and food, as well as the different views and purposes of the farmer.

The long agitated question, whether large- or small-sized animals are the most profitable, or pay the grazing farmer the most money for the food they consume, is not yet fully decided; nor is it probably capable of being easily ascertained, on account of the great difficulty of making experiments under an exact similarity of circumstances, in regard to breed, pasture, food, exposure, and other points; and what is the difference in the growth, or increase of weight, or of labour, between large and small animals, in proportion to the quantity of food which they take for their support. And lastly, what is the difference in the increase and quickness of feeding, in stock of different sizes, in relation to the quantity of food which they consume. A varied set of experiments, correctly made with a view to these different points, would no doubt lead to many useful conclusions, though they would not, probably, finally settle the dispute, on account of the great difficulties that must always attend such comparative investigations, from the variation of circumstances and other causes. It would seem therefore, that, in the present state of our knowledge, no certain directions can be given, in respect to the size of cattle, that will be generally applicable in governing the conduct of the grazier. The largeness



of size, though it is a property that may be desirable, in so far as it affords the means of feeding to a great weight; yet, as this is probably acquired by a much larger and longer continued consumption of food, it is probable that, except in situations where food is abundant, the smaller-sized animals may be the more profitable. In deciding the point, it is not merely, as has been seen, the difference in the quantity of flesh that they are separately capable of affording, but the difference of such quantity in relation to the consumption of food, that is to be considered. It was found by Mr. Bakewell, that the "smaller the bone, the truer the make of the beast," and the quicker in fattening\*; which throws the advantage on the side of small size: and the experience of graziers in general seems to favour the same conclusion, as they commonly find that the middling and small breed are the most profitable, from their fattening with the greatest expedition. And it has been well remarked, that the Lincolnshire and Holderneffe breeds of cattle "are very large, but their size lies in their bones: they may be fattened to great loss to the grazier," but can never "return so much for a given quantity of grass as the small-boned, long-horned kind†."

It may perhaps be objected by some, that the difference in the consumption of food between the large- and small-sized animals is not so considerable as is commonly supposed. But though it must be allowed that considerable latitude may take place in this respect, according to the state of the digestive organs and other causes, long experience among graziers has shown in the most decisive manner, that a number of small-sized stock consume much less food in a given time than large, as in some cases they can stock nearly in the proportion of two to one. Mr. Knight, however, inclines to the side of large cattle being the most profitable, from their not consuming food in the proportion of their weight; as, on putting the question of the difference in the weight of food consumed by the largest and smallest in a given time, to different breeders in different parts of the district where he resides, he found that they agreed, "that the same quantity of food was given to the smallest and the largest beast of the same age; that the largest, even when not master of the same fold, often kept itself in the best condition; and that every thing depended on the disposition to fatten, and very little on the size of the animal." In his own stock he also asserts the same thing to be precisely the case‡. It is however admitted, as just stated, that a certain quantity of large cattle will mostly

\* Young's Eastern Tour, Vol. I. † Ibid.

‡ Communications to the Board of Agriculture, Vol. II.



consume more than the same quantity of small ones; but not by any means in proportion to their weight.

With regard to any difference that may take place in the quality of the meat from the difference of size, it would seem to be in favour of the smaller breeds; as the fineness of the muscular fibre, or what has been commonly termed the grain of flesh, has been found to be the most delicate in the smaller breeds of animals. It is on this account, as well as that of convenience, that the mutton, beef, and other sorts of meat of small animals are so constantly preferred by the nice palates of those who indulge in the pleasures of the table.

In opposition to the idea that small animals, when fatted, are in common worth more for any given weight of meat than large ones; it is contended, that if the animal be taken as it stands in the pasture or stall, the contrary is the truth; but that, when the butcher merely buys what are termed the valuable parts, and receives the offal into the bargain, he will unquestionably, for obvious reasons, "give more for two cows of twelve stone each a quarter, than for one of twenty-four." The offal is of much greater value, besides a considerable advantage in the hides\*. In short, it is concluded that "the difference between the weight of the animals when living, and of the four quarters when dead, is always in an *inverse* proportion to their size when their forms and merits are equal; but the bones will *then* be in proportion to the *living-weight*, and therefore small animals must be in this case *most disadvantageous to the consumer*."

From the greater size of the muscular parts in large animals, the flesh would, however, seem to be more coarse in the very large breeds, and of course be less valuable, than in those of the small.

It is also supposed an advantage in the large animals, that the meat when preserved for future use is not only better, from the juices being more fully retained, but from there being less waste, on account of the external surface being proportionately less.

And it is observed, in regard to the opinion that animals of the smaller kinds are in general more hardy than those of the large breeds, that if it be meant merely that they are capable of subsisting on shorter herbage, it is right; as a large animal, though it may have exactly the same form as the small one, necessarily requires more time for rest. It feeds and removes itself with greater labour; and notwithstanding it may be as strong again, as having double the weight, it will still in relation

\* Knight in Communications to the Board of Agriculture, Vol. II.

† Ibid.



to itself be a weaker animal. Its head and neck will be as heavy again, and from their greater length, the weight will recede further from the centre of motion in the shoulder; consequently increase in power in proportion to the distance: and the same thing holds good in respect to the whole of the limbs. In the stall, or the fold, where large oxen are mostly fed, these disadvantages are of no consequence, as the food is received without the trouble of looking for it; and if the necessity of a better pasture does not proceed from the larger animal consuming much more, but from less power in collecting food, the consequence will be, that it must "afford the largest weight of flesh with the smallest consumption of grass\*."

Small-sized animals have been asserted to be less prejudicial in poaching the ground than large ones, on account of their feet being wider in proportion to the weight. It is however observed by Mr. Knight, that "the question is, whether the feet and mouths of two small animals will not injure the herbage more than that of one large one." It is remarked that small sheep do not poach the ground at all; yet it is supposed that "a score of these weighing a ton in the aggregate will do more injury to a rich pasture in forty-eight hours than an ox of the same weight in a week." Cows and oxen should, it is said, be kept in the stall and the fold when the ground is wet during the winter, and capable of being injured by poaching; and in the summer it is not injured by the heaviest stock.

In cases where the weight of meat is of no material consequence, as in dairy cattle, the advantage may be on the side of small animals, as such cows will give nearly the same quantity of milk separately as those of the large kind; and are capable of subsisting on shorter herbage, and without injuring the ground in the same degree: but where the weight and value of the meat form the principal considerations, the largest animals the pastures are calculated to support, are supposed to be the most beneficial to the breeder and the public†.

In the smaller-sized animals, there are, however, advantages in their being capable of being fattened wholly with grass, without having recourse to the more expensive kinds of food, which must be the case with those of a large kind, and on pastures of inferior qualities; in their being procured with less difficulty, and more adapted to particular situations and circumstances of farmers; and from there being less loss in case of accidents taking place‡.

\* Knight in Communications to the Board of Agriculture, Vol. II.

† Ibid.

‡ Sir John Sinclair in the Farmer's Magazine, Vol. III.



On these grounds, as there appear some things favourable to each side, the attention of the breeder should be principally directed by the nature and circumstances of his pastures, as well as the command of other sorts of food which he possesses; the middle and smaller breeds of live stock being preferred on the less rich and inferior kinds, and the large sorts in such situations as are more rich and fertile, and wherever there is a sufficient command of food.

It is, without doubt, a matter of much utility and importance to have such breeds of domestic animals as are possessed of tame and gentle dispositions, without being too dull or sluggish in their habits, as such animals are not only less disposed to ramble and break the pastures, but are capable of being reared, fed, and rendered fat, with considerably less food. In the production of this sort of disposition much depends upon the modes of rearing the animals. Mr. Bakewell had all his animals, even his bulls, so tame and gentle, from early care in this respect, that they could be managed with the greatest ease and facility.

Hardiness of constitution is another property in live stock that deserves the attention of the breeder. In exposed situations it is an essential and indispensable property; and under all circumstances it must be advantageous for the farmer that a breed is not liable to disease. Besides, hardy animals always thrive much better than such as are more tender and delicate in their nature. The circumstances which have been commonly supposed to denote this disposition are those of darkness of colour and roughness of hair. Animals of other colours are however frequently not deficient in this property: and it does not seem to depend much upon the colour, but perhaps on the breed, and the manner in which the animal has been reared.

There is another property which is of great consequence to the breeder, as much of his profits must always depend, in a great degree, upon it. This is that of quickness in arriving at the state of maturity. With this the abundance of supply is likewise, in a great measure, connected: of course it is a property that greatly interests the public as well as the farmer, and on both accounts deserves the particular attention of the breeder. It is probable that some sorts of stock, from their labour, or the produce which they afford, may be kept longer with profit by the farmer than others. This has been supposed to be the case with neat cattle, though not with sheep; but the distinction is perhaps not well founded, as the latter obviously afford a return in various ways\*.

It is evident that the manner in which animals are fed must have much influence

\* Sir John Sinclair in *Farmer's Magazine*, Vol. III.



in this respect ; as when, from the constant full supplies of food, they are always kept in a thriving condition, they will of course arrive much earlier at the state of maturity than under the contrary circumstances. This will be the case, whatever the nature of the stock may be. It has been asserted that, under this mode, a greater progress is made in three years than in the ordinary pinching method of rearing is effected in five\*. The necessity of not suffering animals to be checked or stunted in their early growth, by the want of proper care, food, and warmth, is thus fully evinced. This is therefore a point that should never be lost sight of by the careful breeder in the raising of his live-stock.

It is scarcely necessary, after the observations that have been made above, to say any thing in addition respecting the nature or quality of the flesh of animals, as it would seem to be a property inherent in the muscular substance, and probably depending in a great measure, if not wholly, on the breed. It is indeed observed by Mr. Marshall, in speaking of the breeding of animals in the Midland districts, where the *flesh* is “spoken of with the same familiarity as the hide or the fleece,” that the grain is clearly understood to depend wholly on the *breed*, and not, as has been heretofore considered, on the *size* of the animal.”

The difference in the flavour of the flesh of different breeds or varieties of animals would seem to depend in a great degree on the nature of the food ; while that of colour is probably in a great measure fixed and inherent, and the effect of breed : experiments are however wanting on these points, in order to place them in a more clear light. The supposition of its having a relation to that of the colour of the skin, is probably without any just foundation.

Wherever any very material deviation from the natural colour of flesh is met with in meat, as has sometimes been the case, it is probably the effect of a morbid condition of the animal. In the living state, the proofs of good flesh are a mellow, elastic, rather firm, feel, without any degree of harshness ; and in the dead condition a similarity of feel, with a fine grain and marbled appearance. The difference of age and sex may likewise afford some variety in respect to the quality of the flesh, as in old animals it must be more firm, and less tender and juicy, than in those that are young, as is found by experience. And the fineness of the grain is mostly found much greater in animals of the female than the male kind. Some of the more northern breeds of Scotch cattle are said to excel much in the quality of their flesh, when killed at a proper age and well fattened.

\* Sir John Sinclair in Farmer's Magazine, Vol. III.



There is another property, in some degree connected with that just mentioned, which is that of the disposition to fatten while young, and in an expeditious manner, when fully fed. This is a property on which the profit of the grazier must in a high degree depend, as, where it does not prevail, much of his food must be uselessly expended. It cannot therefore, in this view, be too much regarded in the selecting of his stock. The circumstances on which it depends have not, perhaps, yet been fully investigated; but it is well known that some animals become fat with a very small consumption of food, while others that eat much larger proportions always remain in a lean state. So far as observation has yet gone, this is a property that would seem to be in some measure connected with smallness of bone. Some think it "probable, however, that a tendency to fatten arises from some particular circumstance in the internal structure of the body, of which small bones are in general an indication; and that it is only in this point of view that they ought to be considered essential; for they often weigh as heavy, and consequently require as much nourishment, as large ones;—small bones, like those of the blood-horse, being compact and heavy; large bones, like those of the common dray- or cart-horse, being extremely porous, and consequently light for their apparent bulk. Indeed, cattle ought not only to be easily maintained in point of quantity, but, in remote and uncultivated districts, in regard to the quality also of the food they consume; and it is certain that some particular animals will fatten as well on coarse fare, as others will do on the most luxuriant\*." The practice of Mr. Bakewell, as well as that of other breeders, would seem to demonstrate that it depends greatly on the form and breed of the animals.

Some have affected to think less favourably of the utility of this property or disposition, on account of the largeness of the proportion of fat that is sometimes produced, which is conceived by no means so useful or economical, in the consumption as food, as that of the lean part. But where a suprabundance or excess of fat takes place, it would seem to be in a great measure the fault of the grazier, and not of the nature or disposition of the breed.

It has been suggested, that the disputes in respect to the utility or inutility of fattening animals to the great degree that has been lately the custom, must of necessity proceed from the want of sufficient discrimination; as fat meat, though not so fit for common use, is in general considered as affording more nourishment than lean, when

\* Sir John Sinclair in *Farmer's Magazine*, Vol. III.



the state and vigour of the stomach are suitable for digesting it; and that although there may, in the common methods of cooking it, be some loss, by proper care and attention there are ways in which this may be almost wholly avoided. Thus, it is remarked that “the keelmen of Newcastle purchase great quantities of fat meat, as they follow the custom, so usual in Scotland, of boiling their meat; the broth of which feeds the family, whilst they themselves eat the meat, generally in a cold state, and in great quantities; and are thus enabled to go through the heavy labour they usually undergo. In many districts, manufacturers and others bake their meat with potatoes under it; and the fat, melted by the fire, falls upon the potatoes, and improves much their taste, and the nourishment to be derived from them. In either of these ways, little, if any, of the substance of the meat is lost\*.”

But such suppositions as the above are probably futile on other principles, as there does not appear to have yet been any other discovery made for increasing the quantity of muscular substance, or lean flesh, than that of cultivating the fattening property of animals. It has long been an observation among breeders and graziers, that “good fat makes good lean.” The importance of this propensity is therefore considerable, and requires the particular notice of the modern breeder in the raising of his live stock.

There remains another property that ought to be regarded in the breed of animals, as it in some measure furnishes the means of determining the disposition to fatten, by the feel which it affords. This is the state of the hide or skin. It is remarked, that “when it feels soft and silky, it strongly indicates a tendency in the animal to take on meat; and it is evident that a fine and soft skin must be more pliable, and more easily stretched out to receive any extraordinary quantity of flesh, than a thick or tough one. At the same time, thick hides are of great importance in various manufactures. They are indeed necessary in cold countries, where cattle are much exposed to the inclemency of the seasons; and, in the best breeds of Highland cattle, the skin is thick in proportion to their size, without being so tough as to be prejudicial to their capacity of fattening†.”

The property of supplying in large proportions a useful product, such as that of milk, is an object that should not be lost sight of by the breeding farmer. The question of the propriety of having a distinct breed exclusively for this purpose, or that of having it only partly calculated for this use, and partly for that of the butcher, has not yet been fully decided; but as it has been found, by long expe-

\* Sir John Sinclair in *Farmer's Magazine*, Vol. III.

† Ibid.



rience, that such cows as have much propensity to fatten, seldom answer the purpose of the dairy, it would seem that there ought to be a breed particularly for the pail. It has however been suggested as probable that, “by great attention, a breed might be reared, the males of which might, in every respect, be well calculated for the shambles, and the females, when young, produce abundant quantities of good milk, yet, when they reached eight or nine years of age, be easily fattened.” Such a breed would, it is supposed, be of the greatest value of any that could be produced. Some of the best English and Scotch breeds are believed to have nearly attained this point of perfection\*.

The fitness of animals for the purpose of labour is a quality that, in certain circumstances, may be necessary to be considered in the breeding of cattle stock. The question of the advantage that may be gained in this practice, in regard to the increase in the quantity of meat, is far from having been decided; nor has it been well explained whether injury may not be done in restricting the growth of the animals by this means, more than can be compensated by their labour. It is obvious, however, that where cattle are worked, they must be longer in being brought to the market. But as, from the greater cheapness of rearing and keeping neat cattle than horses, and various other causes, it may be necessary to make use of cattle for the purpose of labour, a breed well calculated in this respect must be desirable.

There still remains another property which it is requisite for the breeder to consider in the improvement of live stock, which is that of *blood*, adopted in analogy to the system of breeding in the race-horse. It is employed to signify the natural, fixed, and inherent properties of a breed or kind, as exemplified in their external appearances. Its utility for the purposes of the breeder is therefore to enable him to discriminate, with greater nicety and correctness, in the selection of such animals as are the most adapted to the improvements he has in view.

These are the main objects to which the breeder should attend, and the means by which he is principally to effect his improvements. The success of his endeavours, to whatever species of excellence his attention may be directed, must obviously in a great measure depend upon the accuracy and correctness of his judgment in choosing those breeds, of whatever sort of live stock they may be, that are most adapted to his circumstances; and in selecting such individuals, both male and female, of such breeds, as are the most perfect and exact in their different parts and properties; cautiously continuing to breed from them, without ever suffering the least intermix-

\* Sir John Sinclair in Farmer's Magazine, Vol. III.



ture by the admission of those of inferior qualities; advancing in this way with the nicest attention to such faults or defects, however trifling, as may arise, so as to alter and correct them by appropriate pairing in the succeeding generations. And as an indispensable assistant in this arduous undertaking, he must constantly have recourse to the aid of good and abundant keep at all seasons, with suitable degrees of shelter and warmth for both the old and young stock; so that they may never decline in flesh or be checked in their growth. This would seem to constitute the great secret of the important art of breeding live stock, which the superior discernment and unwearied perseverance of a single individual raised to a degree of notice and perfection that has had the happiest effects in bringing the improvement of our domestic animals to a state of excellence perhaps unequalled in any other country.

In every system of breeding or improving of live stock, the greatest attention is consequently necessary to keep. It has been well observed that "all good stock must be both bred with attention and well fed; and that it is necessary that these two essentials in this species of improvement should always accompany each other; for, without good resources for keeping, it would be in vain to attempt supporting a capital stock, and with such resources it would be absurd not to aim at a breed somewhat decent in quality\*." But improvements of this nature can, in general, only be effected by degrees, as the pecuniary circumstances of but few farmers admit of a total change. How much soever they may disapprove of what they have in possession, they can only object to a few of the inferior: this, however, is in their power; and, by always selecting the best for breeding and rearing, improvement will in time be effected. Great improvements in cow stock may doubtless be made by a proper selection of the best heifers in carcase and milk-bag for breeding stock, but more particularly by a judicious choice of the bull. But as prime or first-rate stock is in but few hands, and the owners generally ask higher prices than farmers in general can afford to give, it would be highly advantageous in this intention to have proper male stock provided by the proprietors of lands†. In this way, the letting of male stock in the midland districts has had much influence; and it is probably only by some encouragement of this nature that the highest improvement in this most important department of husbandry can be attained.

It has been also remarked, "that there is one circumstance relative to the choice or introduction of all new breeds, which must not be passed over in silence, because no farmer can neglect it without certain loss. Every kind of pasture is fitted to raise

\* Corrected Agricultural Report of Staffordshire. † Ibid.



animals to a particular size. When beasts of a larger size are brought in, than the quality of the food is calculated to support, these animals, whether cows, horses, or sheep, or any other kind, will degenerate apace, and never prove useful until they come down to that standard or size adapted to their situation and suited to their food. On the other hand, when a smaller breed than ordinary is brought in, they continue to increase in bulk, until they come up to the pitch which is suited to their nourishment. But there is this remarkable difference betwixt these two progressions in respect of profit, that in the retrograde progress, when animals are brought from rich pasture, and a comfortable situation, to the reverse, they are in every instance worse than the indigenous breed; whereas the animals which are brought from worse to better, continue to improve till they arrive at that perfection which the change in their situation is calculated to produce. These causes may not immediately have their full effect, but in a few years they certainly and evidently will. He makes, for this reason, a much safer experiment who brings cattle from worse to better, than he who brings them from better to worse. This reasoning applies to all plants as well as animals. Highland cattle rise to a great size, not only by the keeping in South Britain, but in rich pastures at home. In vain will you attempt to improve a breed of animals beyond the circumstances of the country as to climate and pasture; while, at the same time, it is no easy matter to discern, without proper trials, how far these circumstances can support a better stock \*." In confirmation of these observations, and others that have been stated above, it has been observed that the "richest grazing land, and the most nourishing artificial food, will certainly pay more in feeding large bullocks, sheep and swine, than it would do in feeding the smaller sizes of the same species; and it is equally obvious that the smaller breeds will answer better on the poor pasture than the large †." Besides these circumstances, in the introduction of new breeds of live stock, there are others that demand attention, such as the particular qualities or properties which the farmer has in view. These must be fully considered; and such a breed as may best answer in these particular intentions be constantly preferred.

In speaking of the vast advantages that may be derived from the improvement of live stock, it has been observed by a late practical writer, that, considering the various breeds of domestic animals as the machines or vehicles by which farmers are enabled to send their herbage and other sorts of food to the markets, they ought, by the study of every suitable means, to promote their improvement, both in respect to

\* Corrected Agricultural Report of Perthshire.

† Corrected Report of Middlesex.



form and the disposition to fatten, in order that the produce of their farms may be disposed of in the most profitable manner, and that, independent of the benefits the farmers would individually derive by such means, from the breeds being rendered less tedious in fattening, and less productive in offal, the public would obtain vast advantage in the great increase of animal food. Indeed, on the supposition that every individual in England and Scotland consumes in the proportion of one sheep in the course of the year, and that there are ten millions in the country, it is calculated that, by improving the breeds of that animal only to the extent of one shilling, which cannot be deemed impracticable, an additional annual advantage would be gained, in that sort of live stock alone, of five hundred thousand pounds\*. This, on the whole of every kind, would therefore be immense †.

After this concise view of the principles, properties, and other circumstances which seem most particularly to deserve regard in the improvement of different sorts of live stock, we may examine the nature and qualities of the several kinds, and the methods of management which are most proper and advantageous in each.

*Neat Cattle.* The breeds and varieties of cattle that are dispersed over the country are so extremely numerous, that no correct enumeration of them has yet been presented to the public; but a few of the more distinguished and valuable sorts have been well described by different writers‡. Almost every district or county has its particular breed or variety of this sort of stock, which, in many cases, is unques-

\* Modern Agriculture, Vol. IV.

† Ibid.

‡ It has been usual to arrange the breeds of cattle, from the nature of their horns, and other circumstances, somewhat in the following manner :

The *Long-horned Breed*.

— *Middle-horned Ditto*.

— *Short-horned Ditto*.

— *Welch Breed*.

— *Suffolk Dun Breed*.

— *Galloway Polled Breed*.

— *Highland or Kyles Breed*.

— *Lowland or Fife-shire Breed*.

And to these may be added the

— *Alderney Breed*. And the

— *Wild Breed*.

The breeds of cattle are also frequently distinguished by the names of the particular districts, counties, or places where they are the most prevalent or the most perfect of their kind.

The above method of arrangement has been in some measure adopted by the writer of a late practical work entitled "Modern Agriculture."



tionably the most proper and suitable ; but in others there is no doubt but that the farmer might be greatly benefited by a judicious change for some other sort more perfectly adapted to his situation and circumstances.

The *long-horned* breed of cattle is distinguished, as the name implies, by the great length of the horns, the thickness and firmness of the texture of their hides, the length and closeness of their hair, the large size of their hoofs, and the coarse, leathery thickness of their necks. They are also in common deeper made in their fore-quarters, and lighter in their hind-quarters, than other breeds\*. In size they are said to be superior to the Suffolk duns, but inferior to the short- and middle-horned breeds†. They are likewise narrower in their shape, and less in point of weight, than the short-horns, though better weighers in proportion to their size ; and the cows of this breed give considerably less milk, but such as affords more cream in proportion to the quantity. In colour they are more varied than any of the other breeds ; but whatever the colour is, they have generally a white streak along their backs, which the breeders term *finched*, and mostly a white spot on the inside of the hough. It is contended by some that they were the native or original breed of this island ; but it is not easy to ascertain the matter : it is however conjectured as probable, that “ these have been the inhabitants of the open plain country ; whilst the wild breed, or perhaps the Welch and Scotch breeds, possessed the woody, wild, and mountainous parts of the island ‡.”

Others, however, think it more probable that “ the long-horned breed originated in importations of cattle from the neighbouring country of Ireland ; and that bulls and cows brought from that island, having been coupled with the antient breed of the district, produced the sort of cattle known by the name of the Lancashire or long-horned,” and which now occupy a large portion of the pasture lands of this kingdom §.

Lancashire is without doubt the mother district of this sort of cattle, but the long-horned breed are also the prevailing sort of stock in the counties of Warwick, Leicester, Gloucester, Chester, and several other of the midland counties ; and it is surprising, and shows great attention in one instance, and equal neglect in the other, that this sort of cattle are at present found in greater perfection in the county of Leicester than in the district whence they take their name||. This is supposed to have arisen “ from the graziers of these counties buying their best bulls and heifers, for many years past, before the people of Lancashire were well aware

\* Culley on Live Stock.

† Ibid.

‡ Modern Agriculture, Vol. III.

§ Ibid.

|| Ibid.



of it. The former paid more attention to that kind which were of a true mould or form, and quicker feeders; while the latter contented themselves with the old-fashioned, large, big-boned kind, which are not only slower feeders, but, when fed, are not such good beef. In short, the little farmers in Lancashire, tempted by the high prices given them for their best stock, had lost their valuable breed before they were sensible of it\*.”

This breed is commonly understood by graziers to be in general rather slow feeders, except that particular kind selected, improved, and recommended by the late Mr. Bakewell, which are said not only to eat less food than the others in proportion to their weight; but to become remarkably fat in a short space of time, and to lay their fat upon the most valuable parts, yet to have little tallow in them when killed; and, when used in the dairy, to give but little milk. This improved “variety also differs, from the rest of the long-horned cattle, in having very fine, clean, small bones in their legs, and thin hides. They are a middle-sized, clean, small-boned, round-carcased, kindly-looking cattle†.” They are supposed to have been raised by means of Mr. Webster’s, or what is frequently termed the Canley stock. Craven in Yorkshire is also famed for a superior variety of this breed of cattle‡.

The Irish cattle are supposed a mixed breed between the long-horns and the Welch or Scotch, but more inclined to the long-horns, though of less weight than those of this country §.

In the *middle-horned* breed of cattle there is probably more variety than in that of the preceding sort. The Devonshire variety, when in a state of the greatest purity, is distinguished by a high red colour, without any white spots, as the breed is reckoned impure when these exist, particularly where they run into one another; by having a light dun ring round the eye; by the muzzle being of the same colour; by being fine in the bone and clean in the neck; by the horns being of a medium length and bent upwards; by being thin-faced; fine in the chaps, and wide in the hips; with a tolerable barrel, but rather flat on the sides; by the tail being small, and set on very high; by being thin-skinned, and silky in handling; and by the property of feeding at an early age, or arriving at maturity sooner than most other breeds: they are a sort of cattle well fitted for draught, both as to hardiness and quick movement, and their shoulder-points are beautifully fitted for the collar||.”

In the Suffex and Herefordshire varieties, the colour is also deep red, with fine hair; very thin skins; necks and heads clean; horns neither long nor short, rather turning

\* Culley on Live Stock.

† Ibid.

‡ Marshall’s Midland District.

§ Culley on Live Stock.

|| Ibid.



up at the points; well made in the hind quarters; wide across the hips, rumps, and surloins; narrow in the chins; tolerably straight in the backs, but the ribs or sides lying too flat; thin in the thighs; bones not large\*. It is observed, that "when all the properties which should attach to an useful breed of cattle are considered, the middle-horned may be said in general to come nearer to perfection than any other in the kingdom. They are of a large size, well formed, and, in disposition to fatten, probably much on a par with the short-horned, and greatly superior to the Suffolk. As dairy-cattle, they are also as valuable as any that fall under the description of quick feeders; for although they give a less quantity of milk than the Suffolk or the long-horned, it is said to be of a richer quality†."

The Herefordshire as well as North Devon varieties of this breed are indeed a very superior sort of stock both for the purpose of labour and that of grazing, as being not only clean, strong, and well made, but affording quick proof under the feeding system. Mr. Marshall likewise remarks that the former, with that of the Gloucester variety, is highly eligible as dairy-stock. The females in the Herefordshire sort have been found to fatten better than any other kind at three years old; except the spayed heifers of Norfolk‡.

The North Devon variety, from the fineness of the grain in the meat, is held in high estimation in Smithfield. And they are said to have great superiority over many other breeds, from their possessing more activity, being better calculated for labour, and having more blood; and which is believed to arise from the circumstance of their being bred from one and two years old bulls and heifers. Great proof in this sort of cattle is shown by the size of the rib, the rotundity of the barrel, and the mellowness of the skin. The colours that are most in esteem, and which denote a superiority in the animals, are those shades of the mahogany kind, especially where there is a silky or glossy appearance in the hide, with a slight degree of waving or curling in the hair§. The ox in this variety is mostly considered in perfection about the fifth year of his age.

This valuable breed of cattle is the most prevalent in the more southern and south-western parts of this country, as in Sussex, Dorsetshire, Hampshire, Devonshire, Somersetshire, and even so far northward as Herefordshire, where the largest, and perhaps the finest, variety of this breed of neat cattle is met with. The Sussex variety, though not so large as the Herefordshire, exceeds those of most of the other districts. The oxen in the Herefordshire sort, when six years old and fattened, will in general

\* Culley on Live Stock. † Modern Agriculture, Vol. III. ‡ Rural Economy of Gloucestershire.  
Annals of Agriculture, Vol. XXX.



CATTLE

PL. XLIV  
Fig. 2. p. 77.

*Supra Bull.*



Printed by the University Press, Cambridge.



The English breed of cattle is the most numerous; wide across the hips, rumps and loins, the ribs are somewhat convex, straight in the back, but the ribs on the sides are not so straight; the ribs are not large\*. It is observed, that "when all the English breeds of cattle are considered, the middle-breed is the most numerous to some extent of perfection than any other in the country. They are of a large size, well formed, and, in disposition to fatten, are not much inferior to the short-horned, and greatly superior to the Suffolk. They are also as valuable as any that fall under the description of English cattle. For although they give a less quantity of milk than the Suffolk or the short-horned, it is of a richer quality†."

The middle-breed as well as North Devon varieties of this breed are indeed a very valuable breed both for the purpose of labour and that of grazing, as being of a hardy nature, and not requiring much food, but affording quick proof under the feeding system. The short-horned breed is said to be the former, with that of the Gloucester and Oxford breeds, to be the best for the purpose of the latter. The former is the Herefordshire sort, and has been found to fatten better than any other kind at three years old, except the short-horned of Norfolk‡.

The North Devon variety, from the fineness of the grain in the meat, is held in high estimation in Smithfield. And they are said to have great superiority over many other breeds, from their possessing more activity, being better calculated for labour, and having more blood; and which is believed to arise from the circumstance of their being bred from one and two years old bulls and heifers. Great profit in this sort of cattle is shown by the size of the rib, the rotundity of the barrel, and the mellowness of the skin. The colours that are most in esteem, and which denote a superiority in the animals, are those shades of the mahogany kind, especially where there is a silky or glossy appearance in the hide, with a slight degree of waving or curling in the hair. The ox in this variety is mostly considered as a superior, about the fifth year of his age.

The short-horned breed of cattle is the most prevalent in the more southern and south-western parts of this country, as in Sussex, Dorsetshire, Hampshire, Devonshire, Essex, &c. and even so far northward as Herefordshire, where the largest, and perhaps the finest, variety of this breed of neat cattle is met with. The Sussex variety, though not so large as the Herefordshire, exceeds those of most of the other districts. The oxen in the Herefordshire sort, when six years old and fattened, will in general

\* Colley on Livestock, p. 100. † Modern Agriculture, Vol. III. ‡ Rural Economy of Gloucestershire, Annals of Agriculture, Vol. XXX.



CATTLE.

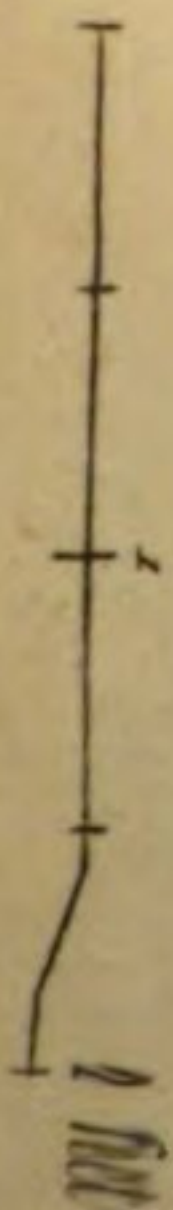
PL. XXIV  
Vol. 2. p. 1120.



Scott del.

*A Suffolk Bull.*

Published Oct. 1. 1804, by Richard Phillips, 7, St. Paul's Church Yard.











Upper View







CATTLE.

PL. XXV  
Vol. 2 p. 1132.



Scott del.

*Supra Cerni.*

Published Oct 1864 by Richard Phillips, 25, St. Paul's Churchyard, W.C.

2 feet







Widdowes Hatford 17m.  
Present to Richard Hatford in 17m. 17m. 17m.











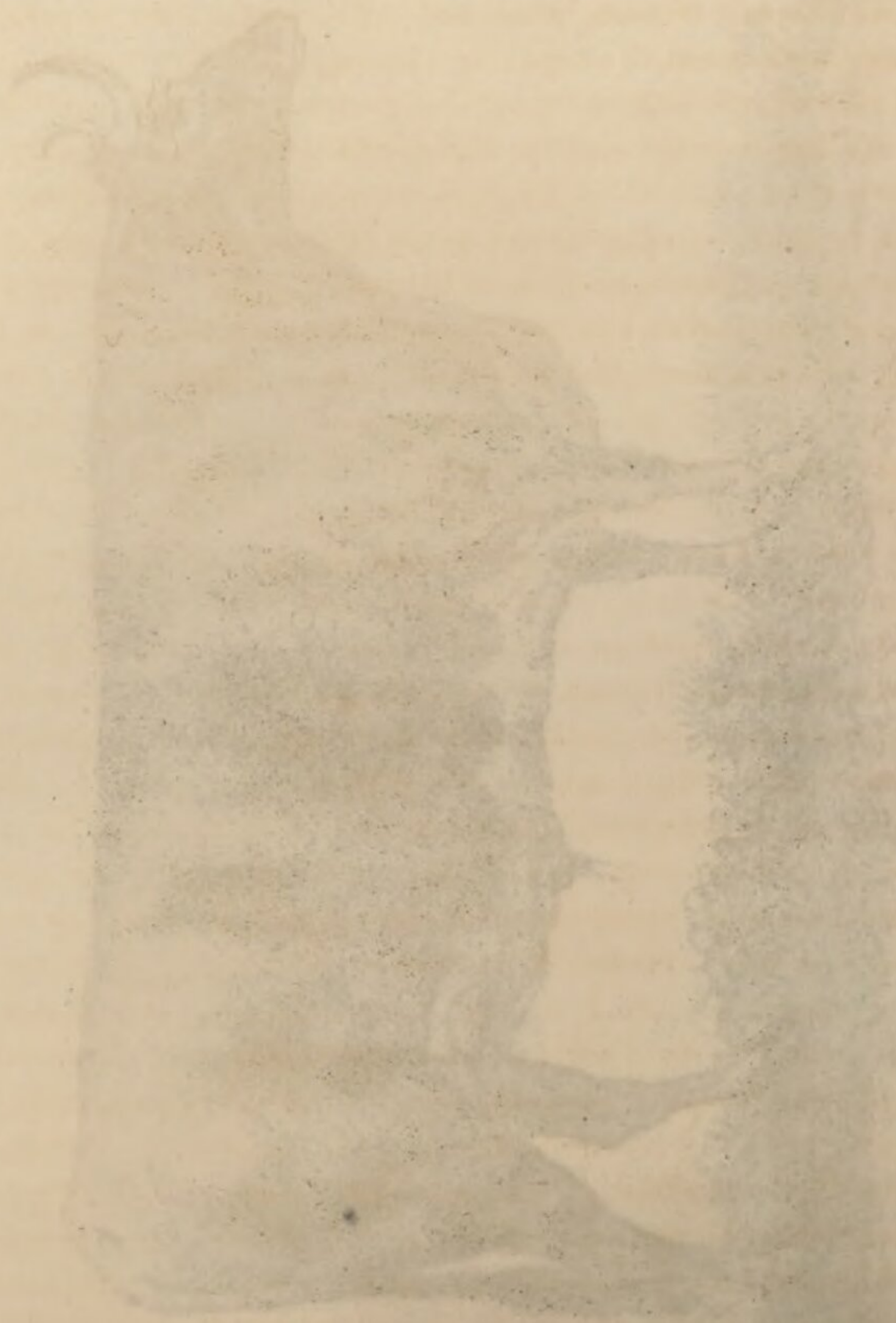
G. Garrard del.

Working Herford. Ox.

Printed for Richard Phillips, 71, St Paul Church Yard, Oct. 23. 1804.

$\frac{3}{8}$  of an inch to a foot.





*[Faint, illegible handwritten text, possibly a signature or date.]*



weigh from sixty to one hundred stones of fourteen pounds, the fore quarters being mostly the heaviest\*. From their being steady and active, as well as capable of great exertion in harness, they are peculiarly adapted to the purposes of the team. They may be wrought from three to five or six years old before they are fattened.

The *short-horned* breed, as the term signifies, is distinguished from the others by the shortness of the horns; by being wider and thicker in the form or mould, and, of course, feeding to the greatest weight; by affording much the largest quantity of tallow when fattened; in having very thin hides, and much less hair upon them than any other breed except the Alderney; and more particularly by the quantity of milk they give beyond any other breed. The great quantity of milk, thinness of their hides, and little hair, are probably the reasons why they are tenderer than any of the other kinds, except the Alderney. It is perhaps justly said of this kind, that they eat more food than any of the other breeds; a circumstance which cannot be wondered at, when it is considered that they excel in those three valuable particulars, viz. in affording the greatest quantity of beef, tallow, and milk.---Their colours are much varied; but the generality of them are red and white mixed, which, when properly blended, is very pleasing and agreeable†.

This is a breed chiefly found in Lincolnshire and the eastern parts of Yorkshire, Durham, Northumberland, and Berwickshire. In consequence of its having been originally imported from Holland, it is frequently called the *Dutch*, and sometimes the *Holderness* breed, from a place of that name in Yorkshire, where it is probable it was first established. As being destitute of the exertion and agility of the middle-horned sort, they are not so well adapted for the cart or the plough. And considering their size, and the quantity of food they devour, it is probable that they are inferior to any of the above-mentioned breeds; and, when compared with the Suffolk duns, very greatly so. This breed has been lately much improved in Yorkshire, where the best of the kind are to be met with.

It is remarked that “the long-horns and these have met upon the mountains which separate Yorkshire from Lancashire, &c. and, by crossing, have produced a mixed breed, called *half long-horns*; a very heavy, strong, and not unuseful kind of cattle‡.

The *Welch* breed of neat cattle, especially that which is found in Cardiganshire, is mostly black, with thick horns turned upwards; small in size; clean-boned; well-shaped, especially where the native breed has not been injured by injudicious crossing with other sorts. This breed is hardy and active, and in great request in the

\* Culley on Live Stock.

† Ibid.

‡ Ibid.



southern counties of the kingdom, on account of the cattle being quick feeders. The quantity of milk which the cows afford is not large; but they are a breed well adapted to the country in which they are found, though capable of great improvement by selecting the best individuals of the native breed\*.

The *Suffolk Dun* breed is a sort of neat cattle found to prevail in that district; and which are easily distinguished by their being polled, of small size, and a dun colour. They are mostly plain in their form. The cows are lean, and large in their bellies. They are valuable for the purpose of the dairy, as the cows give large quantities of milk†. The weight of this breed of cattle is mostly on the average from fifty to sixty stone. The author of the *Treatise on Live Stock* seems to think this only a variety of the following breed, produced in consequence of the great connection between the Scotch drovers and the Suffolk and Norfolk feeders, as both sorts are in general polled; and though the Suffolk are mostly light duns, while the others vary greatly in colour, this might take place from some partiality to that colour.

The *polled* or *Galloway* breed of cattle is also very valuable. In weight and size, it is as much less than the long-horns as these are than the short-horns. The cattle generally weigh from forty to sixty stone, some particular ones reach seventy and upwards: but their most essential difference from every other breed of cattle is their having no horns at all: some few, indeed, in every other respect polls, have two little knobs, from two to four inches long, hanging down loose from the parts where other cattle's horns grow, joined to the head by a little loose skin and flesh. In most other respects these cattle resemble the long-horns both in colour and shape,—only they are shorter and more compact in their form; which probably makes them weigh less. Their hides seem to be in a medium state, not so thick as the long-horns or so thin as the short-horns; but, like the best feeding kind of long-horns, they lay their fat upon the most valuable parts, and their beef is well marbled or mixed with fat‡.

The origin of this breed was probably in Galloway, a large district in the south-west of Scotland, where they are mostly bred upon the moors or hilly country, and grazed upon the lands nearer the sea until rising four or five years old, when the graziers and drovers take them up in great numbers to the fairs in Norfolk and Suffolk, previous to the turnip-feeding season; whence the greatest part are again removed in the winter and spring, when fat, to supply the consumption of the capital, where they are readily sold at high prices, few or no cattle selling so high

\* Modern Agriculture.

† Suffolk Corrected Report.

‡ Culley on Live Stock.



in Smithfield market, from their cutting up so nicely, owing to their laying their fat upon the most valuable parts;—a great excellence in all feeding cattle\*. They also prevail in Dumfriesshire and Ayrshire.

The polled cows of this breed are said to be good milkers in proportion to their size, the milk being of a rich quality, and yielding much more butter from a given quantity than in the short-horns. The oxen and spayed heifers have also been asserted to answer well for draught. They are probably, however, in general, too small for this purpose.

But though the cattle of the above district are mostly polled, they have several with horns, which they contend are a bastard or mongrel breed, produced by crossing with long-horned bulls from other districts. The polled ones, and of these the black or dark brindled ones, are preferred to any other, as they allow them to be the original breed of the country. The breeders in Galloway, however, complain of their old breed being lost, or at least much worn out.

The *Highland* or *Kyloe* breed of cattle is less in proportion to the polled cattle than they are to the long-horns. This breed is also covered with a long close coat of hair, like the polls and long-horns; and, like these, the beef is fine-grained, well-flavoured, and mixed or marbled, but not so handsome on the outside, when exposed in the market, not being of so bright a colour, and often spotted with black, even upon the best parts, except when made very fat. When grazed, they feed very readily, their weight in general being from twenty to thirty-five stone; some particular ones reach to more than forty stone. The most prevalent colour is black; some are brindled or dun; but the breeders there, like those in Galloway, prefer the black ones†.

This hardy breed is in possession of all the extensive mountainous country, the Highlands of Scotland, together with the Western Isles‡. The Isle of Skye cattle are the smallest in size, but the most perfect in other respects of perhaps any of the Kyloe or other sorts; a circumstance which is supposed to depend on its being a pure unmixed breed. The removal of the imperfection of size deserves the attention of the breeder§.

This breed is probably calculated in every respect to thrive in a cold, exposed, mountainous country, and probably better adapted to the cold regions where they are bred than any other kind. They are driven to the southward in great numbers every autumn; many into the western districts of Yorkshire, but the greatest part into Norfolk, Suffolk, Essex, and other parts of the south, where they are fattened. This

\* Culley on Live Stock.

† Ibid.

‡ Ibid.

§ Modern Agriculture, Vol. III.



sort of cattle is frequently termed *kyloes* in these parts of the country; probably from a district in Ayrshire called Kyle, where they prevail much.

The *Lowland* or *Fifeshire* breed of cattle is rarely met with in an unmixed state. "Towards Cumberland the cattle are half long-horns, half polls; on the borders of Northumberland they are mixed with short-horns until you reach Tiviotdale, where they become altogether a small coarse kind of short-horns, or what the Yorkshire jobbers call *runtis*; except a few pretty good short-horned cattle, bred in that pleasant and fine country, the Tweedside\*." This same kind of runtish coarse breed continues all the way to the Frith of Forth. Crossing this narrow sea into Fifeshire, it might at first be imagined that the Fife cattle were a distinct breed, from their upright white horns, their being exceedingly light lyred, and thin-thighed: but Mr. Culley is pretty clear that it is only from their being more nearly allied to the kyloe breed, and consequently having less of the coarse kind of short-horns in them. The cattle all along this coast continue to change more and more, growing still less, until, upon the edges of the mountains, they become quite of the kyloe kind; but still much inferior to that pure, unmixed, valuable breed of kyloes which occupy the more northern and western Highlands, and the different isles; but particularly the Isle of Skye, and that tract of country called Kintail†.

The *Alderney* breed of cattle is very delicate and tender, so as to be little attended to by farmers. They are not able to bear well the cold of this island, particularly the more northern parts of it. They are in general fine-boned, light red or yellow in colour, and their beef generally yellow or very high coloured, though very fine in the grain, and well-flavoured. They make themselves very fat; and are not in the least subject to lye, or have black flesh. Very useful cattle have been bred from a cross between an Alderney cow and a short-horned bull. This is a breed that is mostly to be met with about the seats of the nobility and gentry, upon account of the cows giving exceedingly rich milk‡.

Besides these different sorts, there is a *wild breed* of cattle, which, as they appear in the breed at Chillingham-Castle, in Northumberland, the seat of the earl of Tankerville, "are invariably of a cream colour, with black muzzles; the whole of the inside of the ears, and about one-third of the outside, from the tips downward, red; the horns white, with black tips, very fine, and bent upwards: some of the bulls have a thin upright mane, about an inch and a half or two inches long. The weight of the oxen of this breed is from 35 to 45 stone, and the cows from 25 to

\* Culley on Live Stock.

† Ibid.

‡ Ibid.



35 stone the four quarters, 14lb to the stone.—The beef is finely marbled, and of excellent flavour. From the nature of their pasture, and the frequent agitation they are put into by the curiosity of strangers, it is scarcely to be expected that they should get very fat; yet the six-years old oxen are generally very good beef: whence it may be fairly supposed that in proper situations they would feed well\*.” They cannot, perhaps from their untameable nature, be of any utility to the farmer, as they are only capable of being retained within walls or very good fences.

It is obvious, from this detail of the various breeds of cattle, that they are not all equally profitable to the breeder, the rearer, the dairyman, the grazier, the butcher, or the consumer. “Some have a greater disposition to fatten than others. Some, being cleaner boned and better formed, have less offal. Some give a greater quantity of milk than others. In a word: some of the particular properties for which cattle are estimable are more discernible in one breed than in another. Whether these can be all united in the same animal, or whether a breed of cattle possessing all the requisite qualifications would be equally suitable to all situations, are questions not easy to be determined. In regard to the first, it seems universally agreed, that there are two properties for which cattle are esteemed valuable, that cannot be united; that is, a disposition to fatten, and a tendency to yield a large quantity of milk. The form of the animal most remarkable for the first is very different from that of the other: in place of being flat in the sides, and big in the belly, as all great milkers are, it is high-sided and light-bellied: in a word, its body is barrel-formed, while that of the other is more fitted to embrace a horse-collar with the wide side downwards. It is not probable, therefore, that the properties of two breeds of cattle, so opposite in form and general appearance, can ever be united in the same animal. If a large quantity of milk, whatever be its quality, is the object, the dairyman must content himself with such plain ill-looking animals as have been described. And as the milk of all cows is well known not to be of the same quality, it appears highly probable, that in proportion as the cows of the milking tribe exceed those that are more disposed to fatten in quantity, in nearly the same proportion will their milk be inferior in quality. If this should prove to be the case, the superiority of the quick feeders one would suppose to be completely established; as, while cattle of this description are confessedly better for the purposes of the graziers, the butchers, and the consumers, they would, if this point were determined in their favour, be also more valuable for the dairy. No person will think of asserting, that a gallon or two of whey or of butter-

\* Culley on Live Stock, and Northumberland Corrected Report.



milk extra (for the question comes to that) is a sufficient reason for preferring a breed of plain-looking, ill-formed cattle, to one that, except in this particular, is more valuable in every respect. In a word, no person, who pretends to a knowledge of the different breeds of cattle, will think of supporting an opinion so erroneous, as that cattle which are disposed to fatten quickly, and at an early age, that, from the superior excellence of their form, have a small proportion of offal, or what the breeders call non-essentials, and that, although they yield not a large quantity of milk, yet make up for that deficiency in the richness of its quality,—are not more valuable than those which have nothing to recommend them but the single property of being great milkers\*.”

Mr. Culley, in comparing the breeds of long- and short-horned cattle, contends that the former excel in the hide, hair, and quality of the beef; the latter in the quantity of beef, tallow, and milk;—and that though each breed has long had, and probably may have, its particular advocates, it is not improbable but that each may have its particular advantages in different situations. Thus the thick, firm hide and long close-set hair of one kind may be a security against those impetuous winds and heavy rains to which the west coast of the island is so subject; while the more regular seasons and mild climate upon the east coast may be more suitable to the constitution of the other.

In regard to the former breed exceeding the latter in the quality of the beef, it is only to the particular variety selected and improved by Mr. Bakewell that preference is to be given in this view; for, as to the long-horned breed in common, it is supposed that their beef is rather inferior than superior to that of the generality of the short-horned kind; and there is little doubt, it is imagined, “but a breed of short-horned cattle might be selected, equal if not superior to even that very kindly-fleshed sort of Mr. Bakewell, provided any able breeder, or body of breeders, would pay as much attention to these as he and his neighbours have done to the long-horns. But it has hitherto been the misfortune of the short-horned breeders to pursue the largest and biggest boned ones for the best, without considering that those are the best that pay the most money for a given quantity of food†.” Such improvements have lately been made in the breeding of short-horned cattle, that they have now been brought to a considerable degree of perfection.

But, notwithstanding these two breeds have hitherto been in possession of the best part of the island; it is suggested that the Galloway cattle, and even the Scotch or

\* Donaldson's Present State of Husbandry, Vol. III.

† Culley on Live Stock.



Kyloes, might be bred with advantage in many situations, so as to be more profitable than either the short-horns or the long-horns, as being “true quick feeders and kindly fleshed\*.”

It is likewise conceived that the latter of these sorts is better adapted to cold moory exposed situations than any other breed, and that particular breeds are probably best adapted to particular situations; on which grounds it is recommended to breeders of cattle to find out which breed is the most profitable and best suited to their situations, and to endeavour to improve that breed to the utmost, rather than try to unite the particular qualities of two or more distinct breeds by crossing; which is a precarious practice, as it is generally found that “the produce inherit the coarseness of both breeds, and rarely attain the good properties which the pure distinct breeds individually possess†.”

In the providing of cow-stock, great attention is necessary in having them bred from such cows as are known to have produced not only good milk in a large proportion to their size, but to have continued it for a great length of time. Well-fed and vigorous bulls should likewise be constantly employed, as by this means the best and most healthy stock may be raised. The method of rearing the calves while young has been already described‡.

The breeding and rearing of cattle-stock is a business that may be accomplished upon most farms of any extent, but to the greatest advantage on those where the quantity of coarse pasture is the most considerable, and where at the same time there is the means of raising large crops of the green vegetable kind for winter use, as in such cases the animals while young are capable of being kept in the best manner and at the least expense. On very small farms the rearing of young cattle can seldom answer, as the produce in most instances may be turned to much more profit in other methods of management. But in whatever situations the breeding and rearing of cattle-stock is attempted, the young animals should constantly be kept in the best manner the nature of the farm will admit of. This is of much greater consequence than is generally allowed in the raising of good stock. But where young animals are pinched for food at an early period of their growth, or fed with such as is not of a sufficiently good quality, they never thrive so well afterwards, or make such good stock. This is a fact that has been frequently noticed in respect to swine; and it does not seem to be less established in regard to other sorts of stock. But, besides

\* Culley on Live Stock. † Ibid.

‡ See Suckling of young Calves, in Section on Cultivation of Grass Land.



good feeding, cleanliness is essential in raising young stock to the greatest advantage. It has been well observed in a late useful practical work, that in the winter the yearlings should "be fed with hay and roots, either turnips, carrots, or potatoes; and they should be thoroughly well fed, and kept perfectly clean by means of litter. At this age it is a matter of great consequence to keep such young cattle as well as possible; for the contrary practice will inevitably stop their growth, which cannot be recovered by the best summer food. If hay is not to be had, good straw must be substituted; but then the roots should be given in greater plenty, and with more attention. To steers and heifers two years old, the proper food is hay, if cheap; or straw, with baits of turnips, cabbages, &c.\*"

Mr. Donaldson thinks the advantage of green winter food for live stock so great, that there is no way in which it can be applied with greater benefit than "by giving the young cattle a daily allowance during the first two or three winters."

Whenever straw is employed as fodder for young stock without the above sorts of food, if it be not very good, or slightly mixed with some grassy material, a little hay should always be blended with it, in order that it may be preserved in proper condition. It is also of consequence that the animals be served with this sort of fodder in a regular manner, as, where too much is given at a time, Mr. Marshall has remarked that they do not thrive so well.

There is another circumstance which is of material importance in the wintering of young stock, which is that of keeping them more warm and sheltered from wet than is usually the case, as by this means they thrive faster, with a less consumption of food, than in the contrary circumstances. This may be effected either by tying them up in stalls, in houses for the purpose, or by keeping them in good sheds in well-inclosed yards.

There are several reasons for keeping young cattle-stock of different ages distinct from each other, both in their winter and summer keeping. It is obvious that in this mode they feed with less interruption and inconvenience to each other. And it is remarked by Mr. Young, "that it is not right to keep yearling calves and two-year-olds together; because, in general, the younger the cattle are, the better they should be fed."

The question of feeding the cattle tied up, or loose in the yards, in winter, has not been yet decided. Each method has probably advantages. In the first the

\* Young's Farmer's Calendar.



cattle thrive better than when left at liberty to run about the yards. Mr. Marshall found that in Yorkshire, cattle kept tied up and regularly fed with straw in a moderate proportion did better than in the southern parts of the island, where left loose in the midst of greater plenty. Whether this effect is to be ascribed to the greater warmth, the resting better, the breed, or the being fed more regularly and *eating with an appetite*, he cannot determine. Some experiments of Mr. Young's also lead to the conclusion, that cattle-stock thrive better when tied up. They likewise show that the practice of tying up is the only one that can be had recourse to where straw is not in great plenty, and the quantity of the stock very inadequate to its consumption\*.

In the latter method there is the advantage of a larger supply of manure, especially where the farmer has the convenience of plenty of litter. Where, however, the farmer has convenience, the former method is probably in general the most beneficial. In either mode of management much attention is necessary to keeping the stock constantly supplied in an evenly proportioned manner, as in this way there will be great advantage both in the saving of food and the condition of the animals.

The most proper age at which cattle should be made to become productive is a point of much importance, but which probably requires more experiments than have yet been instituted to fully ascertain it. Much may perhaps depend upon climate, situation, and the manner in which they have been reared and kept; as where the situation is favourable, and the keep rich and good, they may be employed in this way earlier than where it is more exposed, and the keep indifferent.

This is supported by the observation of Mr. Marshall, that in Yorkshire while the lands were in the state of commonage, the heifers "were frequently kept from the bull until they were three years old: now, in the state of inclosure and improvement, and at the present high rents, they are frequently suffered to take the bull when yearlings, bringing calves at two years old. The arguments for bringing heifers in at two years old are, that they come sooner to profit; and that farmers cannot afford, at the present rate of rents, to let them run unprofitably, until they be three years old. On the other hand, the argument in favour of bringing them in at three years old is, that, not being stinted in their growth, they make larger and finer cows than those which are suffered to bear calves at a more early age."

The superiority in the profit of these different practices has not been yet experimentally determined; but as it can scarcely be doubted but that an unfavourable

\* Annals of Agriculture, Vol. XVIII.



check must be given to the growth of the cows as well as their offspring, by their being made to produce at an early age, before they have attained their full maturity, from their not being able to take in and digest a sufficiency of food for their own increasing growth, and the perfect support of the young animal; it may be the best method to pursue a middle course, so as to bring them in on the rich lands; where the effect just noticed may be the most fully counteracted, at two years old, and in other cases, where the keep is inferior, at three. By this practice the interest of the farmer may be best promoted in all cases, and the least injury sustained in his flock. But in order to induce heifers to take the bull at so early a period, they must be constantly well kept. When this business is too long protracted they are more liable to miss having calves. Therefore, in general, letting the heifers take the bull at two years old may be the most proper time.

The cow takes nine months and a few days in most cases to complete the business of gestation, and seldom produces more than one calf at a time. A cow may produce her young at any season of the year; but it is of great consequence to the farmer to have the cows to calve as early as possible in the beginning of the year, while veal and all the products which they afford are dear; and that the calves, when reared, may be got forward in the best manner. In some districts, farmers think it the most advantageous for them to calve when there is a full bite of grass, especially in the first calf, as they are supposed to be rendered better milkers thereby afterwards, in consequence of the secretion of the milk being more completely established\*.

In all cases the cow-flock, especially that part of it which is in calf, should be as well kept and sheltered from cold and wet in the winter months as the nature of the farm will admit. By keeping the cows in good condition in this way, they not only calve with greater safety, but take the bull again much sooner, and are more advantageous in their milking. The practice of foddering with straw should be as much avoided as possible, and the method of management that has been already recommended adhered to as much as can be†. The farmer may indeed take it as a certain rule, that no benefit can be derived from bad keeping in any sort of breeding animals.

The vigour of the bull will last several years, if not made too free with while he is young, but he is usually in his most perfect state from two or three years old to five or six. These animals should be kept in well-inclosed places, and have the

\* Sir John Sinclair in *Farmer's Magazine*, Vol. III.

† See Cow-keeping in Section on the Cultivation of Grass Land.



cows brought to them. The practice of working them is not in general to be advised, as they are apt to become by that means too dull and heavy for leaping. They should always be kept well in this intention. In rearing young bulls they should be constantly supplied with food in a plentiful manner from the period of their being calved till they are full grown. Mr. Bakewell was so convinced of the advantage of plentiful support in these cases, that he is said to have employed two cows in rearing some of his best stock of this kind.

In raising oxen, whether for the purpose of sale or work, they should be kept constantly in tolerable condition, without ever being suffered to become stunted in their growth, by either their winter or summer keep. When designed for the market, they are disposed of at two, three, or four years old when not worked, according to circumstances. Where the intention is to work them, they should be trained as early as possible, and be brought into work at the age of two, or three years at the furthest. In Herefordshire the steers are brought into work at three years old, and are worked two years, mostly in yokes, though harness has lately been getting more common. In teams of six or eight they plough something less than an acre a day\*. But in the northern parts of Devonshire, where the breed is admirably calculated for the purpose of labour, the oxen are yoked in at from two to three years old, being worked lightly; and at four years old they are brought into hard work, and from that age to six they are capable of performing a full day's labour. They there find, that if an ox is to be raised to the largest size, he must be worked; as, when kept till five or six years old without working, he will not reach the size he would have done if he had been inured to labour. This is the fixed opinion of the best informed farmers in that district†. While under this system they should be well supported with dry food; such as oats in the straw, bean-meal, good hay, or cut-chaff; and by the use of these in small proportions, with a few cabbages, turnips, carrots, or potatoes, they may be kept up in perfect condition. It is a practice that can never answer to the farmer, to let his working cattle-stock get low in condition, as the saving is a mere trifle in comparison to the disadvantage of bringing them into flesh afterwards.

The ox mostly reaches his full growth at six, but the largest-sized grow the longest. It is unprofitable to keep them longer than seven or eight years old.

In this district four are the usual number in a team, and occasionally two in cross ploughing; and with a double-furrow plough six. Four plough an acre a

\* Knight in Communications to the Board of Agriculture, Vol. II.

† Annals of Agriculture, Vol. XXX.



day, and six fully two acres every day for six weeks. On arable farms of two hundred acres from eight to twelve oxen are sufficient; and three horses and ten oxen, or four horses and eight oxen, are equal to the labour of one of one hundred and fifty pounds a year, when nearly two-thirds of the land are managed in a convertible method of husbandry, proper allowances being made for different circumstances\*. The method of managing them there is by means of the yoke and bows, in preference to the collar, as in such mountainous districts the powers of the animals are in this way, or that by the head, more effectually brought into action. Lord Somerville has found this to be the case from actual trial, being convinced that the pole and the yoke form the true lever for the ox†. Yoked in this manner, the labour is performed with great expedition and dispatch by these animals. Some advise the oxen not to be worked too hard, and in this view think six should be employed in a team, four working at a time, and two remaining alternately at rest. Whatever practice may be pursued in this respect, it is extremely necessary that the oxen be well shod before they are put to the work, as, where this is neglected, they soon get lame and useless. As there is considerable trouble and often danger in casting them, in order to perform this operation, it is better to have a machine contrived so as to shoe them standing. Useful contrivances of this nature have been described‡.

The continued rise in the expense of horse-keep strongly shows, and at the same time enforces, the necessity and great benefit of making use of oxen in all cases where they can be employed to advantage.

In the fattening of oxen or other sorts of neat cattle, various systems of management are practised in different cases, according to the particular circumstances and objects the farmer has in view, which have been already explained§.

The age of neat cattle is shown by their mouths and horns. When turned two years old, the places of the calf-teeth are supplied by two new ones, and in every succeeding year two more are added until five, when the mouth is said to be full; but this is not probably the case until six years old, as the two corner teeth are not fully protruded till that period.

In the horn, the first ring or circle does not take place till three years old, after which a fresh one is added every succeeding year, as long as the horn continues; but these rings are often effaced by the artifices of the jobbers and dealers in cattle, for the purpose of deceiving the purchasers.

\* Annals of Agriculture, Vol. XXX.

† Ibid.

‡ Ibid. Vol. XXXVI.

§ See Grazing and Stall-feeding in Section on Cultivation of Grass Land.



Cattle are subject to a variety of diseases, which it is impossible to consider in any full or satisfactory manner in a work of this nature; but a few remedies that have been found beneficial in particular cases may be here mentioned in addition to those already noticed.

In cases of obstinate scourings, much advantage may be derived from a strong decoction of common chalk, hartshorn-shavings and cassia, in the proportion of half a pound of the first to four ounces of the shavings, and one ounce of the cassia; boiling them in two quarts of water to three pints, the last articles being put in towards the close of the operation: to this may be added, when cold, a pint of lime-water and two drams of the tincture of opium. The whole being well mixed in a bottle, two or three good horn-fulls may be given twice or three times in the course of the day.

In the *Yellows*, which is a disease to which cows are very subject, advantage has been found from the use of soap in the quantity of about one ounce, given once or twice a day, dissolved in a quart of the usual cordial drench, a little warm, keeping the animal confined, and using warm mashes and warm water occasionally.

Where there is a discharge of *bloody urine*, great relief has been derived from a strong decoction of oak or Peruvian bark, in which a small proportion of alum has been dissolved; two or more horn-fulls being administered twice or three times in the day.

The *Foul* is a disease in the feet of cattle, often proceeding from hard driving from a distance. After cleaning the parts, and wholly discharging the matter formed in the claws, they should be dressed with some mild digestive application, and be kept perfectly free from dirt, gravel, or other extraneous substances.

The *Garget* is a disease frequently affecting the glands of the udder with hard swellings. It often arises from the cows not being clean milked, and may be removed by anointing the part twice a day with a little ointment composed of camphor and blue ointment; half a dram or more of calomel being given in warm beer from a horn for three or more mornings if the disease be violent.

In fresh wounds, nothing further is necessary than keeping the parts clean and well covered from the air, previously drawing the skin over as much as possible.

*Sheep.*—The great value and importance of this animal in its flesh, fleece, and other products which it affords, is well known. As there are but few farms on which sheep cannot be kept with advantage in some intention or other, such as for the purposes of breeding, grazing, or the fattening of their lambs, it is obvious that they must constitute an object of the first consequence to the farmer. In many situations,



by much the greatest part, and in others the whole of his profits, depend upon them.

In disposition, the sheep is naturally tame, quiet, and inoffensive. It is possessed of less means of defence than most other animals, and at the same time more timid; which induces it to seek the society of the flock. The vale or pasture sheep are in general much more mild and gentle than those of the mountain or heath kinds. The sheep continues to increase in growth till three years old, when it is in common in the greatest perfection for the purpose of being fattened, but will be suitable for this use, as well as that of breeding, till five or six; but as a quick return is the great object of the grazier, they are mostly fattened at as early an age as possible.

The breeds and varieties of sheep that are scattered over the island are extremely numerous; but have been arranged and distinguished under different classes or breeds, by different farmers, in a variety of methods, as from their having horns or being without them, from the nature of their wool and various other circumstances\*; but whatever may be the principle of distinction that is adopted, it is evident that they possess characteristic differences that may serve to discriminate them into distinct original breeds.

As in cattle-stock we have already seen that there is a certain form and connexion of parts that bespeak the excellence or perfection of the breed, so in the sheep the same is the case, and the nearer any breed approaches to it, the more perfect or excellent it may be considered. In the ram Mr. Culley has thus described it: "Head fine and small, nostrils wide and expanded, eyes prominent,

\* It has been remarked by Lord Somerville in his "System of the Board of Agriculture," that "all the breeds of sheep in this kingdom may be arranged into two classes; those which shear the short, or clothing, and those which shear the long, or combing wool."

The practical author of the Present State of Husbandry in Great Britain has arranged them under the three following general divisions:

- 1st. The Mountain breed.
- 2d. The Short-woolled breed: and
- 3d. The Long-woolled breed.

The first comprehending the several varieties that occupy the different mountainous and elevated situations in Wales, Westmoreland, Cumberland, Yorkshire, the South, West, and North of Scotland, and in the Shetland Islands; the Cheviot-hills in the South of Scotland and North of England, and the forest and common sheep of the last country.

In the second are included those of Hereford, Dorset, Suffex, Norfolk, and some parts of Cumberland.

The last division embraces all those varieties that are dispersed over the more rich and fertile parts of England, and which are distinguished under the titles of the Durham or Teeswaters, the Lincolnshires, the old and new Leicestershires, &c.









G. Searard. del.

1/4 inch to a foot.

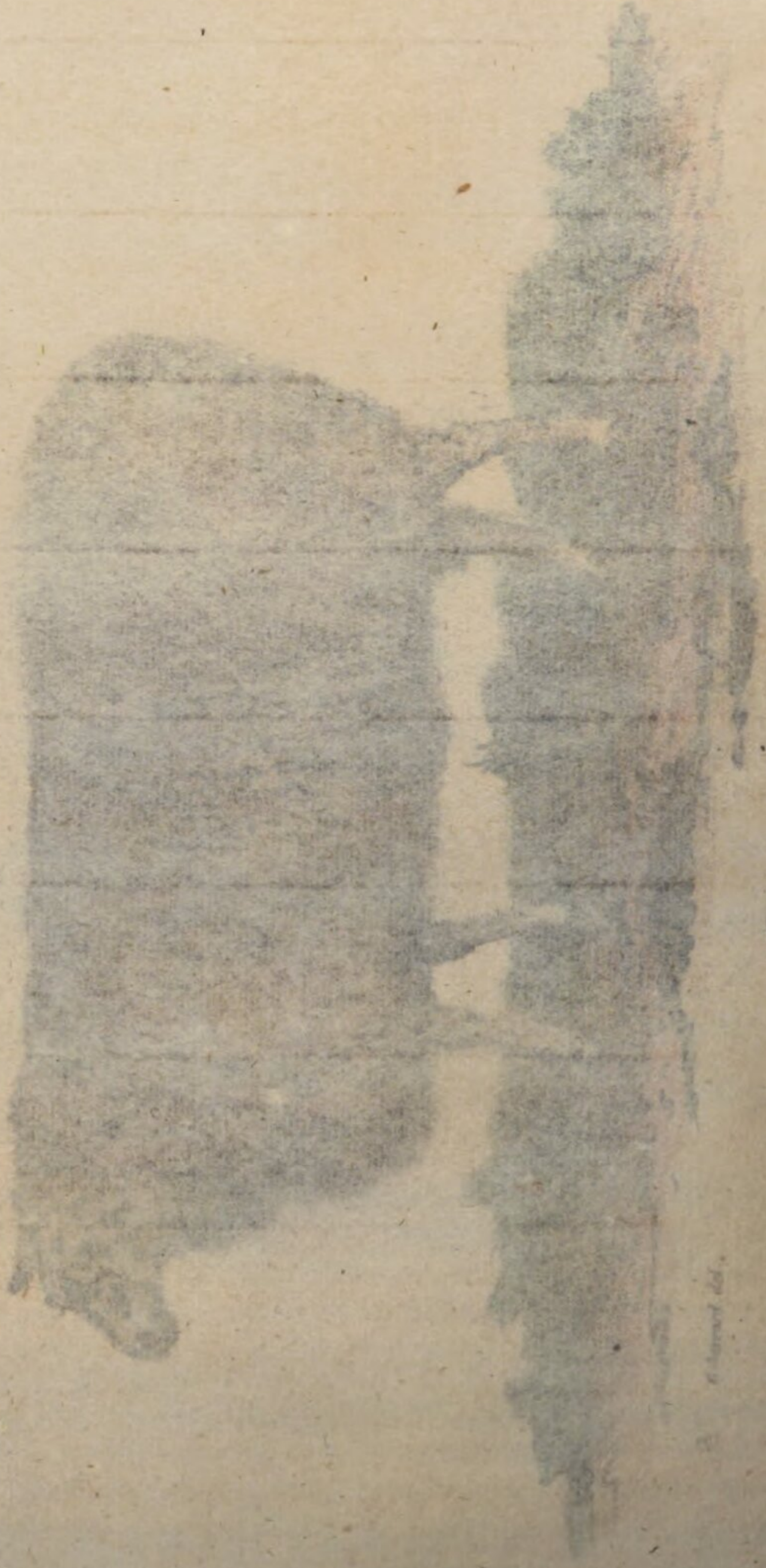
*Dishley Cove.*

Printed for Richard Phillips, 71 St. Paul's Church Yard, Oct. 23 1804









*Dickley Lane.*

*Printed by Richard Phillips, 7, St. Paul's Church Yard, West 1849.*

*A. Smith & Co. Printers.*

*A. Smith & Co. Printers.*



rather bold or daring, ears thin, collar full from breast and shoulders, tapering gradually to where the neck and head join, which should be fine and graceful, being free from any coarse leather hanging down, shoulders broad and full, joining so easy to the collar forward and chine backward, as to leave no hollow in either place, mutton upon arm or fore-thigh quite to knee, legs upright with clean fine bone equally clear from superfluous skin and coarse hairy wool, from the knee and hough downwards, breast broad and well forward, to keep fore legs at a proper wideness; girth or chest full and deep, and instead of a hollow behind the shoulders, that part by some called fore flank quite full; back and loins broad, flat, and straight, from which the ribs must rise with a fine circular arch; belly straight; quarters long and full; mutton quite down to hough, which should neither stand in nor out; twist or junction of inside of thighs deep, wide, and full, which, with the broad breast, keep the fore-legs open and upright; thin pelt covered with fine bright, soft wool." This is the model which, in so far as form is concerned, the breeder of this sort of stock is to aim at in the improvement of his sheep, having proper regard to the several other properties that have been already mentioned.

The *New Leicester* or *Dishley Breed* is distinguished from the other long-woolled breeds by having fine lively eyes, clean heads without horns, straight broad flat backs, round or barrel-shaped bodies; fine small bones; thin pelts, and a disposition to make fat at an early age; to which may be added a superiority in the fineness of the grain and flavour of the mutton to that of other sheep of the large long-woolled

But Mr. Culley, in his "Observations on Live Stock," discriminates them with greater minuteness into several different breeds, in the following manner:

|                  |           |                       |                 | Weight of<br>Sheep. | Prices per lb.<br>1791. | Wethers<br>per qr. | Years old<br>when killed. |
|------------------|-----------|-----------------------|-----------------|---------------------|-------------------------|--------------------|---------------------------|
| 1 Dishley.       | No horns, | White face and legs,  | Combing wool,   | 8 lbs.              | £. 0 0 10               | 25 lbs.            | 2                         |
| 2 Lincoln,       | Do.       | Do.                   | Do.             | 11                  | 0 0 10                  | 25                 | 3                         |
| 3 Teeswater,     | Do.       | Do.                   | Do.             | 9                   | 0 0 10                  | 30                 | 2                         |
| 4 Dartmoor,      | Do.       | Do.                   | Do.             | 9                   | 0 0 8                   | 30                 | 2½                        |
| 5 Exmoor,        | Horned,   | Do.                   | Do.             | 6                   | 0 0 8                   | 16                 | 2½                        |
| 6 Dorset,        | Do.       | Do.                   | Carding wool,   | 3½                  | 0 1 2                   | 18                 | 3½                        |
| 7 Hereford,      | No horns, | Do.                   | Fine do.        | 2                   | 0 2 9                   | 14                 | 4½                        |
| 8 South Down,    | Do.       | Gray faces and legs,  | Do.             | 2½                  | 0 2 0                   | 18                 | 2                         |
| 9 Norfolk,       | Horns,    | Black faces and legs, | Do.             | 2                   | 0 1 5                   | 18                 | 3½                        |
| 10 Heath,        | Do.       | Do.                   | Course combing, | 3½                  | 0 0 6                   | 15                 | 4½                        |
| 11 Herdwick,     | No horns, | Speckled do.          | Carding,        | 2                   | 0 0 6                   | 10                 | 4½                        |
| 12 Cheviot,      | Do.       | White faces and legs, | Do.             | 3                   | 0 0 11                  | 16                 | 4½                        |
| 13 Dun-faced,    | Do.       | Dun faces and legs,   | Do.             | 1½                  | 0 3 0                   | 7                  | 4½                        |
| 14 Shetland,     | Do.       | Colours various,      | Fine cottony,   | 1½                  | 0 3 0                   | 8                  | 4½                        |
| 15 Romney Marsh, | No horns, | White faces and legs, | Combing,        | 8                   | 0 0 10                  | 25                 | 2½                        |
| 16 Spanish,      | Horns,    | Do.                   | Carding,        | 3½                  | 0 4 0                   |                    |                           |



kind. The weight per quarter in ewes three or four years old from 18lbs. to 26 lbs.; in two year old wethers, from 20lbs. to 30lbs.; the length of wool from six to fourteen inches\*.

The advantage of this breed is supposed to consist in its producing a better profit to the farmer, in proportion to the quantity of food consumed, than most others; in being more perfectly formed, and consequently more disposed to fatten quickly; in containing a much larger proportion of meat on an equal weight of bone; in thriving well on such pastures as would not support other sorts of the same size; in being capable of being kept or fattened in larger proportions to the acre than other breeds of the same size of carcase; in the wool being more valuable, though less in quantity; in their being ready for the butcher in the early part of the spring instead of the autumn, by which there is a considerable saving in the summer's grass; and in the mutton, from the closeness of its texture, keeping longer than that of other equal sized breeds.

The principal objections to this improved breed have been made on the grounds of their fattening too much, and the mutton in consequence becoming less delicate in its flavour than in that of other breeds that require a greater length of time in the process; on the deficiency in the quantity of wool which they produce; and on their not being calculated for the fold. It is, however, unquestionably a valuable breed on particular sorts of pasture that are adapted to it, as is evident from its rapidly making its way into different districts†.

It has been further objected to this breed by some, that the sheep are too small, and that, from the thinness of their skins or pelts, they may not be so capable of bearing cold; but experience does not seem to support such conclusions.

The ewes in this breed are usually put to the ram so as to have lambs at two years old, when they mostly produce two lambs each in the proportion of about one-third of the whole, where they have been kept well; which should always be the case. When their forms are good they may be kept for the purpose of breeding till three or four years old‡.

The wethers may be killed so early as at two years old, with the greatest profit, as when kept longer they are apt to get unnecessarily fat.

The *Lincolnshire Breed* is known by having no horns; white faces; long thin weak carcases; thick rough white legs; bones large; pelts thick; slow feeding; mutton coarse-grained; the weight per quarter in ewes from 14lbs. to 20lbs.; in three year old wethers from 20lbs. to 30lbs.; the wool from 10 to 18 inches in length§.

\* Culley on Live Stock.

† Annals of Agriculture, var. loc. and Lincolnshire Agricultural Report.

‡ Culley on Live Stock.

§ Ibid.



This breed, as the name implies, is chiefly prevalent in Lincolnshire and other rich marsh or grazing lands.

It is however, probably, capable of being kept with advantage, and made fat, only on the richest sorts of grazing pastures. But in these cases it may be kept with more profit than the above breed to three years old. The weight of mutton which the sheep afford is great; but the flesh coarse, with a large proportion of bone. The chief excellence is in the large quantity of wool which they afford, which pays for their being kept longer than other breeds before they are made fat. In its improved state it is, however, a breed much less profitable to the farmer than those that feed quicker, except in the case of such rich pastures as have been mentioned.

In the *Tees-water breed* the legs are longer, finer boned, and support a thicker and more firm and heavy carcase than the Lincolnshire; the sheep are much wider on the backs and sides; and afford a fatter and finer grained mutton. The weight per quarter in two-years old wethers is from 25 lbs. to 35 lbs., and in particular instances to 55 lbs. or more. The wool is shorter and less heavy than in the preceding breed\*.

This is the largest breed of sheep in the island; and is the most prevalent in the fine fertile inclosed lands on the borders of the Tees in Yorkshire.

In this breed, which is probably from the same stock as the above, more attention has been paid to size than wool. It is only calculated for warm inclosed rich pastures, where they are kept in small lots, and well supported with food in severe winters. They produce a large weight of mutton; but then from their requiring so much longer time and richer keep, and being admitted in so much smaller proportion on the acre, they are probably not upon the whole so profitable, even in situations where they can be kept with the most chance of success, as the smaller more quick feeding breeds.

The ewes of this breed are however, in general, very prolific, mostly bringing two and frequently three lambs each. And in some cases a greater number have been produced†.

Improvements have been made in this breed by crossing with the new Leicesters. It is a breed that is however very seldom found pure.

This is a sort of sheep that has been greatly neglected, but which, if judiciously improved by crossing, it is supposed would answer and pay well in districts proper for its support. It is suggested by Mr. Parkinson, in the Corrected Report of the State of Agriculture in the West Riding of Yorkshire, that an useful kind is capable of

\* Culley on Live Stock.

† Ibid.



being raised by crossing the ewes of this breed with Dishley rams, in the management of an expert breeder. Indeed, by the use of these, and those of the Northumberland kind, the quality of the wool and the mutton has not only been greatly improved, but the quantity of bone and offal much lessened; and, at the same time, the fattening property considerably increased; they becoming fatter at two years old than the others are at three. The wethers of this improved sort generally sell unshorn at two years old, from 45 to 55s. a piece, and weigh from twenty-four to thirty pounds the quarter\*.

The *Romney-Marsh breed* of sheep is without horns; white faces and legs; rather long in the legs; good size; body rather long, but well barrel-shaped; bones rather large †. Weight per quarter in fat wethers at two years old, from 22lbs. to 28 lbs. Wool fine, long, and of a delicate white colour.

This breed has the quality of arriving at the state of fatness at an early age, as well as that of producing a large fleece of fine long combing wool, which renders it highly valuable. But from the size, and the circumstance of the heaviness of the coat, it is only capable of being kept and fattened on the rich kinds of pasture: in such situations it is, however, an excellent breed.

On the rich marsh lands from Hastings to Rye, the graziers find this breed much more advantageous than the South Down; the marsh wethers fattening more quickly ‡. The wool afforded by this breed of sheep is mostly large in quantity; in marsh fat wethers averaging six pounds, and in breeding ewes five pounds, but not equal in quality to the wool clipped from shearlings §. A proof of the great value of this breed of sheep, as well as of the land on which they are fed, is seen in the manner of stocking, which in *tags* is from four to seven per acre, in fattening wethers from six to eight, in barrens from two to three, and in couples three ||.

The *Dartmore or Devonshire Natt breed* is chiefly distinguished by having no horns; white faces and legs, thick necks, backs narrow, and back-bones high; sides good; legs short, and bones large. Weight of ewes on the average about 20 lbs. per quarter; in wethers at two years and a half old 30 lbs. Length of wool much the same as in the preceding breed. It is a breed which is predominant in some parts of Devonshire, as the name sufficiently indicates ¶.

This breed is said to have received considerable improvement by being crossed with the new Leicesters.

\* Corrected Report of North Riding of Yorkshire.

† Young's Eastern Tour, Vol. III.

‡ Sussex Report, 4to.

§ Ibid.

|| Synopsis of Husbandry.

¶ Culley on Live Stock.



The *Exmoor breed* of sheep is characterized by having horns, and white faces and legs; by being very delicate in the bone, neck and head; by the form of the carcase being indifferent; narrow and flat-sided. Weight per quarter in wethers at two years and a half old from 15 lbs. to 18 lbs.; and the weight of wool much less than in the preceding breed. This small breed of long-woolled sheep is principally produced on, or in the neighbourhood of the moor from which it takes its name, which is in the northern extremity of the above county\*.

This sort of sheep are frequently kept two or three years merely for the annual profit of their fleeces, which often do not exceed more than four pounds in weight. But from their being kept upon very bare and indifferent pastures while young, they are supposed by many sheep farmers to be a very profitable sort of stock†.

The *Dorsetshire breed* is known by its mostly having horns, white faces; long small white legs; by the carcase being rather long and thin; and by the mutton being fine-grained and of good flavour. Weight per quarter in wethers at three years and a half old from 16 lbs. to 20 lbs. Wool fine and short‡.

This breed has the peculiar property of producing lambs at any period in the season, even so early as September and October, so as to suit the purposes of the lamb-suckler.

The Wiltshire sheep are considered by Mr. Culley as a variety of this breed, which have acquired an increase in weight. And other varieties of it are met with in several other districts.

It is a breed that has been found to answer well in some of the midland districts, and, from its close make, to be equally advantageous with almost any other. It is, however, supposed capable of improvement by being crossed with rams of a larger size§.

The *Herefordshire breed* of sheep is known by the want of horns, and having white legs and faces; by being small in size; and the wool growing close to the eyes; by the carcase being pretty well formed; and by the excellence of the mutton. Weight per quarter from 10 lbs. to 18 lbs. Wool fine and short||: the lean poorest sheep producing the finest. The true breed of this sort of sheep is frequently denominated *Ryelands*.

This breed is found to be remarkably patient of hunger¶; but in its management requires *cotting* in the winter season, and being fed with hay or peas-halm. In some

\* Culley on Live Stock.

† Billingsley's Survey of Somersetshire.

‡ Ibid.

§ Pitt's Survey of Staffordshire.

|| Culley on Live Stock.

¶ Knight in Communications to the Board, Vol. II.



cases they are indeed housed all the year round in the night-time. The cots are low covered buildings, proportioned to the extent of the flocks. They are said to fatten the best at four years old\*. The *Archenfield* or true Herefordshire breed produces the finest wool. And Mr. Knight remarks that the disposition of sheep to fatten in the north-west part of that district is in proportion to the fineness of the wool; but he is not certain of its being so in this breed. But it seems to him that where the wool is close and fine, there are many advantages; less nourishment is drawn from the body in its support than in the contrary case. The long coarse-woolled fleece admits the rain more freely, and by dividing on the back lets it down to the skin. It also takes in a larger weight of water, which must more inconvenience the animal already heavily loaded. The fine close fleece of this breed admits the water with difficulty, even when immersed in it, in washing, and is never wet through by rain. On account of the closeness of the texture, it only lodges on the outside, and is easily removed by the animal shaking itself. Besides, a fleece of this kind is much more warm and light. On these grounds it is supposed, that no breed of sheep in the island is capable of subsisting on so small a proportion of food.

By crossing this breed with the Dishley an useful kind of sheep has been produced, both the wool and carcase being increased in weight, but much injured in respect to fineness.

The *South-Down breed* is distinguished by having no horns; gray faces and legs; fine bones; long small necks; and by being rather low before, high on the shoulder, and light in the fore-quarter; sides good: loin tolerably broad; back-bone rather high; thigh full; twist good; mutton fine in grain and well flavoured. Wool short, very close and fine; in length of staple from two to three inches. Weight per quarter in wethers at two years old 18 lbs †. This breed is predominant on the dry chalky downs in Suffex.

It has been lately much improved both in carcase and wool; and for the short less fertile pastures is an excellent sort. The sheep are hardy, and disposed to fatten quickly. Mr. Ellman, of Glynd, is in possession of a very superior flock of this valuable breed. Where the ewes are full kept, they frequently produce twin lambs, nearly in the proportion of one-third of the whole, which are, when dropped, well woolled. The wethers are capable of being disposed of at an early age, being seldom kept longer than two years old, and often fed at eighteen months.

\* Culley on Live Stock.

† Ibid.







The Long Coat or Long-woolled Down Breed is the most common in the night-time. The ewes are the most numerous of the flock. They are said to be the best of the breed, the *downfield* or true Herefordshire breed. Mr. Knight remarks that the disposition of sheep to be fat is in proportion to the fineness of the wool. The Long Coat is long, but it seems to him that the Long Coat is not so good as the Down Breed, as it is not so much improved; less nourishment is given to it than in the contrary case. The long coarse-woolled breed is not so good, and by dividing on the back lets it down to the ground, which must more inconvenience the sheep. The long close fleece of this breed admits of being washed, and is never wetted. The texture of the wool is only lodged on the surface, and is not so much improved. Besides, a fleece of this kind is much more warm and light. Mr. Knight remarks that no breed of sheep in the island is capable of subsisting on so small a proportion of food.

By crossing this breed with the Down, an useful kind of sheep has been produced, both the wool and carcase being increased in weight, but much injured in respect to fineness.

The *South Down* breed is distinguished by having no horns; gray faces and legs; fine bones; long short necks; and by being rather low before, high on the shoulder, and light in the fore-quarters; sides good; loin tolerably broad; back-bone rather high; thigh full; twist good; mutton fine in grain and well flavoured. Wool short, very close and fine; in length of staple from two to three inches. Weight per quarter in wethers at two years old 18 lbs  $\frac{1}{2}$ . This breed is predominant on the dry downs of Dorset.

This breed has lately much improved both in carcase and wool; and for the short and fine texture is an excellent sort. The sheep are hardy, and disposed to fatten quickly. Mr. Eliman, of Glynd, is in possession of a very superior flock of this valuable breed. Where the ewes are full kept, they frequently produce twin lambs, nearly in the proportion of one-third of the whole, which are, when dropped, well woolled. The wethers are capable of being disposed of at an early age, being seldom kept longer than two years old, and often fed at eighteen months.



*SHEEP.*

Pl. XXIX  
Vol. 2. p. 2140.



one foot

*A South Down Ram.*

*Published Oct. 1. 1804, by Richard Phillips, 74, St Pauls Church Yard.*









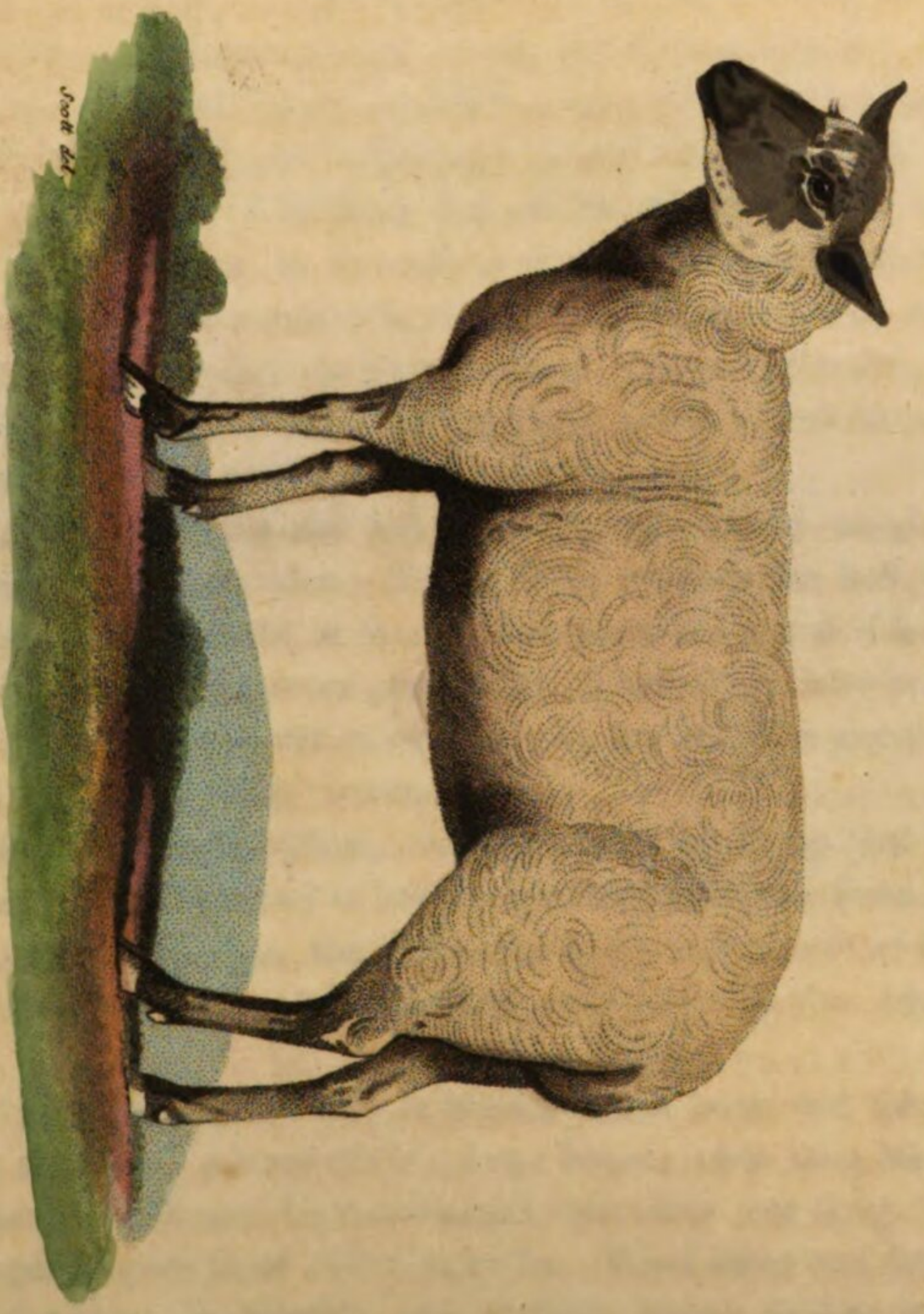






SHEEP.

PL. XXX  
Vol. 2. p. 1141.



South d. ewe

*A South Down Ewe.*

Published Octo. 1804, by Richard Phillips, 7, St. Pauli Church Yard.

one foot







The ewes are usually kept till between four and five, and found to answer well to the graziers in the neighbourhood, as well as the farmers in Norfolk and the adjoining counties, in the place of home-bred sheep, as being more expeditious feeders, and equally adapted for the purpose of the fold\*.

It is a breed of sheep, which from the compactness of their form, and their legs being shorter, considerably outweigh both the Dorset and Norfolk breeds in proportion to the size of the carcase, being heavy in a small compass. Their hardiness is estimated according to the darkness of the colour in the face and legs; but as there is inconvenience in the produce on this account, from the wool, especially about the head and neck, becoming spotted with black, and thereby thrown aside by the stapler, as only of half the full value, a middle degree of colour may be the best. As an open country breed, they are sufficiently gentle and tractable. They are capable of travelling well, and of resisting the effects of exposure to cold. The wool is scarcely, if at all, inferior in fineness to that of the Herefordshire kind; as the practice of sorting, which is common in that district, is not in use on the Downs. The merit of this breed is such as to have induced the sheep-farmers in various districts to introduce them in preference to the above breeds; and on comparative trials, they have been found to possess a superiority†.

They have been found to consume less food in proportion to weight than the Norfolks, yet keeping in better order. Young sheep produce the best lambs; the *crones* are of course constantly sold at four or five years old; and if it were done earlier it is supposed it would be more profitable. These sheep have been brought to a high state of improvement in various respects by the attentive exertions of Mr. Ellman and other intelligent sheep-farmers‡.

On Cannock Heath in Staffordshire, there is a sort of sheep that has much resemblance to this, and is believed to have originated from the same breed. It has lately been much improved in the form, thickness and weight of the carcase, as well as the fineness of the wool, by crossing with rams of the Herefordshire breed§.

In the *Norfolk breed* of sheep the face is black; horns large and spiral; carcase long, small, weak and thin; narrow chine; large bones; very long black or gray legs; mutton fine-grained and high-flavoured, but does not keep well in hot seasons. Weight per quarter from 16lbs. to 20lbs. Wool short and fine||. This breed is chiefly prevalent in Norfolk and Suffolk, where folding is much the

\* Agricultural Survey of Suffex, 4to edition.

† Culley on Live Stock.

‡ Annals of Agriculture, Vol. XI.

§ Corrected Report of Staffordshire.

|| Culley on Live Stock.



practice, as they have the property of travelling well. In disposition they are given to be restless.

This sort of sheep, as possessing few valuable properties in addition to that of their standing the fold well, and as requiring much expense in their winter keep, an acre of turnips being the usual allowance for half a dozen besides hay, have lately given way to the preceding breed, which is supposed by some to be hardier, less nice in their food, sooner ready for the fold, and more quiet\*.

The circumstances most favourable in this breed of sheep are those of their being the native stock of the district; their bearing the fold better than others in that cold climate; their travelling well to distant markets, their mutton being good and in high estimation in Smithfield; and the produce in wool, though small, of a good quality†. The South Down breed has, however, been found to answer so well in the districts where this sort of sheep is predominant, that some experienced sheep-farmers have introduced them with considerable benefit.

The *Heath breed* of sheep is known by having large spiral horns; black faces and legs; a fierce wild-looking eye; short firm carcase; mutton excellent in grain and flavour. Weight per quarter from 12 lbs. to 16 lbs. Wool open, coarse, and shaggy. This is an extremely active and hardy breed, which is first met with in the more north-western parts of Yorkshire, whence it has extended itself over the extensive mountainous tract of country on the borders of the Irish Sea, which stretches from Lancashire to Fort-William in the western Highlands of Scotland. The great objection to it is the coarseness of the fleece‡. These sheep are very active and hardy, which has rendered their introduction into the high mountainous exposed districts advantageous. They are mostly fattened about the third or fourth year, at which age they are found to answer the best. They afford a very superior sort of mutton.

It is probable, that they might be much improved in their coats by being crossed with some of the larger fine-woolled breeds.

The *Herdwick breed* is distinguished by having no horns; by the face and legs being speckled, the larger the portion of white with fewer black spots, the purer the breed; legs fine, small and clean. Weight per quarter in the ewes from 6 lbs. to 8 lbs.; in the wethers at four years and a half old from 9 lbs. to 12 lbs. Wool short, thick and matted in the fleece§.

This breed is peculiar to the elevated mountainous tract of country at the head

\* Annals of Agriculture, Vol. XIX. † Kent's Survey of Norfolk, and Marshall's Rural Economy.

‡ Culley on Live Stock.

§ Ibid.



of the rivers Esk and Duddon in Cumberland, where they are let to herds, whence the name. They are said to possess the property of being extremely hardy in constitution.

This small breed is so extremely hardy, as to support itself on the rocky bare mountains with the trifling support of a little hay in the winter season; scratching down to the heath during the snows.

The ewes, from the nature of the climate, produce their lambs late; but which, when dropped, are well woolled. They are generally kept as long as they produce lambs.

The wether stock is mostly disposed of from the mountains, without being put in the pastures, at from four to five years old.

The fleece in this breed is finer than in that of the preceding; but coarser than any of the short-woolled breeds. They stand in need of a cross with some of the finer-woolled breeds.

The *Cheviot breed* of sheep is known by the want of horns; by the face and legs being mostly white, and the eyes lively and prominent; the body long; little depth in the breast; narrow there and on the chine; clean, fine, small-boned legs and thin pelts. The weight per quarter, when fat, from 12lbs. to 18lbs; wool partly fine and partly coarse\*.

It is said to be a valuable breed of mountain sheep where the herbage is chiefly of the natural grass kind†; which is the case in the situations where they are found the most prevalent, and from which they have obtained their name. It has undergone much improvement within these few years in respect to its form and other qualities.

This breed has been lately introduced into the most northern districts; and from its hardiness, its affording a portion of fine wool, and being quick in fattening, it may answer well in such situations.

The practice of milking the ewes of this breed for the purpose of making cheese is found to be prejudicial to the animals, and has of course been much left off by the best sheep-farmers.

The *Dun-faced breed* has no horns; the face, as the name implies, is in common of a dun tawny colour; the size small; tail short; mutton fine. Weight often only 6lbs. or 7 lbs. the quarter. Wool variously streaked and blended with different colours, some of which is very fine‡. Mr. Culley supposes this to partake of the Spanish breed. It is not so hardy as the preceding.

The *Shetland breed* is small, and mostly without horns; but what more particularly distinguishes it from other breeds is, the uncommon smallness and shortness of

\* Culley on Live Stock. † Ibid. ‡ Ibid.



the tail. Weight per quarter from 7 lbs. to 10 lbs. Wool very fine, and of various colours.

This is a very hardy breed, but too wild in its disposition to be confined in inclosed pastures.

In the *Merino* or *Spanish breed* of sheep the males have horns, but the females are sometimes without; white faces and legs; the body not very perfect in shape; rather long in the legs; fine in the bone; a degree of throatiness or production of loose pendulous skin under the neck; and the pelt fine and clear. Weight when tolerably fat per quarter in the rams about 17 lbs.; in the ewes 11 lbs. Wool very fine\*. This breed is asserted to be tolerably hardy, and to possess a disposition to fatten readily †.

Mr. Knight observes that the produce of the crosses with this breed and the Archenfield or Herefordshire sort are very ugly, and, he is informed, subject to the foot-rot.

In these breeds of sheep, we have seen that there are evidently differences in their sizes, forms, flesh, wool, and other properties, that admirably adapt them for different sorts of pastures, situations and uses. The large long-woolled breeds, from their being more slow, heavy and tame in their dispositions than most other kinds, are in general the most proper for the rich inclosed pasture districts: the breeds which possess greater length in the legs, more activity in walking, and a less burthen of wool, are suited to the more elevated lands, such as the *downs*, *moors* and *beaths* in different parts of the island, where the pasturage is less fertile and luxuriant: and the small light-carcafed, hardy breeds are most adapted to the exposed mountainous situations, where the food is more sparing, and obtained with greater difficulty.

Mr. Marshall, in the *Rural Economy of the Midland Counties*, has indeed observed, that a very long-woolled breed of sheep, such as the old Lincolnshire or Teeswater, is necessary for the richest sound grass lands, and the finest worsted manufactures; and another, as the new Leicester, for the less fertile grass lands as well as the rich inclosed arable lands, where the practice of folding is not in use; for the purpose of the coarser sorts of worsteds, flockings, baize, coarse cloths, blankets, carpets, and other similar articles: a middle-woolled breed, such as the Wiltshire, the Norfolk, or the South Down, for the well-soiled arable lands, where the fold is employed, for the making of cloths of the narrow medium kinds: a very fine-woolled breed, such as the Herefordshire Ryeland, for the purpose of the finest cloths: and the Shropshire, or some of the more hardy breeds, for the heathy mountainous situations.

It is therefore necessary, in introducing new breeds of sheep, for the farmer to

\* Lord Somerville's *System of the Board of Agriculture*.

† Ibid.



attentively consider the nature and situation of his pasture, and cautiously avoid employing larger or finer breeds than can be properly supported. Upon the proper regulation of this point much of his success in the improvement of his sheep-stock will depend. And where the bettering the form or improving the quality of the wool are in contemplation, this is to be particularly regarded, while such improvements are attempted by judicious crossing with proper breeds for the purpose, on the principles that have been already explained.

It seems evident from a variety of facts that have been lately presented to the notice of the farmer\*, that wool of the finest quality may be produced in this country by means of *Spanish sheep*, and their being judiciously crossed with our own fine-woolled breeds; a circumstance of the greatest national importance, as affording a probable means of rendering us independent of the foreign supply of this expensive but indispensable article. Too much attention cannot therefore be bestowed by the breeding sheep-farmer in promoting this sort of improvement wherever the nature of his land will admit of it, which may be the case, in most situations, where the short-woolled breeds of sheep can be properly kept, or probably on more than one half of the pasture-lands of the kingdom†. There is one inducement to this, which is that of its not interfering with the production of the most valuable sort of mutton, a point to which the sheep-breeders of this country have till lately been particularly attentive, almost without regarding the quality of the wool; as it has been found that the quality of the flesh in the different divisions of sheep inclines to the nature of the wool, the short-woolled sheep being close in the grain of their flesh, of course heavy in the scale, and in the taste high flavoured; while the polled long-woolled sort are more open and loose in this respect, larger in size, and the mutton more coarse, and in general less saleable‡.

In the management of sheep different systems are pursued, according to the nature of the farms on which they are kept, and the methods of husbandry that are practised; but whatever these may be, it is a principal object with the best sheep-managers to preserve them in as good condition as possible at all seasons of the year. This is particularly the case with the pasture kinds of sheep. In order to accomplish it in the best manner, it is useful to divide them into different parcels in respect to their ages and sorts, as by such means they may be kept with more convenience and advantage than in large flocks together under a mixture of various kinds. In this mode there will be less waste of food, and the animals at

\* Lord Somerville's System of the Board of Agriculture.

† Lord Somerville in Communications to the Board, Vol. II.

‡ Ibid.



the same time thrive better, and the pastures be fed with much more ease and facility. The benefit of this management has been fully experienced in many of the northern districts, where they separate the sheep-stock into lambs, yearlings, wethers, and breeding ewes. It is probable, too, that in this practice a much larger proportion of flock may not only be kept, but the sheep be preserved in a more thriving and healthy state.

It has been the common practice, except in particular instances, to leave the ewes for the purpose of breeding without any selection; but it is obvious, that where good sheep-stock are desired, much care and attention should be bestowed in choosing such as are the most perfect, and possess in the highest degree those properties which are wanted, let the breed or variety be what it may; as it is only by adhering to this principle that success can be ensured.

This business should therefore be carefully performed at the time they are turned to the ram, if it has not been done before. And it is equally necessary that a similar degree of attention should be paid to the selecting of the rams, and the adapting of them to the ewes. It is remarked by Mr. Young, in his Farmer's Calendar, that the late Duke of Bedford, in attending to this point, had every ram with the lambs got by him the preceding year put in distinct pens, that he might not only examine them but their progeny, previous to his deciding "what ewes to draw off for him." This method is highly judicious, and deserving of imitation by the less intelligent sheep-farmer. "Such attention," it is added "united with a careful selection of cull lambs, must keep a stock in a state of progressive improvement, proportioned to the accuracy of judgment, eye, and hand of the farmer who practises it."

The most advantageous and proper age for ewes taking the ram in the different breeds has not been fully shown; but from a year to a year and a half old may be sufficient, according to the forwardness of the breed and the goodness of the keep.

The usual time of having the rams admitted is about the beginning of October; except in the Dorsetshire ewes, where the intention is suckling for house-lamb, in which case it should be much earlier, in order that the lambs may be sufficiently forward. But, by being kept very well, any of the breeds will take the ram at a much earlier period. Where the rams are young, the number of ewes should seldom exceed sixty for each ram; but in older rams a greater number may be admitted without inconvenience; but letting them have too many should be cautiously avoided, as by such means the farmer may sustain great loss in the number of the lambs.



The ewe goes with lamb about the space of five months, of course the common lambing-season is March, or the early part of the succeeding month; but in many of the more southern districts, where sheep-husbandry is carried on to a considerable extent, some parts of the ewe-stock are put to the rams at much earlier periods, so as to lamb a month or six weeks sooner; a practice which is attended with much profit and advantage in many situations where early grass-lamb is in great demand. It is usual for the rams to remain with the ewes for a month or six weeks, and in some cases longer, in order to complete the business of impregnation, which in some districts is ascertained by smearing the *fore-bows* of the rams with red-dle, ochre, or some similar substance that has the property of marking\*.

During the time the ewes are in lamb they should be kept in the pastures, and as free from disturbance as possible, and be carefully attended to, in order to prevent accidents which are liable to take place at this time, such as those of their being cast in the furrows without the means of getting up again. In case any of the ewes should slip their lambs, they should be immediately removed from the flock†. They require, as is the case with all other sorts of live stock in similar circumstances, to be kept as well as the nature of the farm will admit, in order that there may be less loss at lambing-time from the ewes being stronger, and the lambs more healthy, and better capable of contending with the state of the season at which they may be dropped. Where pastures or other sorts of good grass-lands cannot be reserved for their support, turnips or other kinds of green food should be provided for the purpose, and given them in a suitable manner; but where it can be done, it is always better to leave this sort of food untouched till about the period of lambing, when it should be regularly supplied in proportion to the necessity there may be. The ewes at this time also demand considerable care being taken to see that they are put upon a dry sheltered pasture free from disturbance, and that neither they or their lambs sustain injury from the severity of the season. Whenever this is the case, they should be carefully removed into a proper degree of warmth and shelter until restored. It is likewise a necessary as well as useful practice, as they lamb down, to take them and their lambs away from the common flock, putting them into a piece of turnips or fresh dry pasture where there is shelter when necessary, as by this means much fewer lambs will be lost.

By the proper supply of turnips at this period, the milk of the ewes is much increased, and the growth of the lambs greatly promoted; which is of much con-

\* Synopsis of Husbandry. † Ibid.



sequence, as when they are stinted at this early period they never turn out so well afterwards.

In the use of this sort of food, where the soil is not sufficiently dry to admit the sheep, it is the best practice to draw the turnips and convey them to a sound firm pasture, in order to have the ewes baited upon them once or twice in the day, according as there may be occasion, particular care being taken that they are wholly consumed and no waste made. The circumstance of their being eaten quite clean up may serve as a rule to the farmer for regulating the daily supply that may be requisite. There can be little doubt but that in this way this sort of food may be consumed to the greatest advantage in respect to economy. But there is a better method where the land is perfectly dry, especially where the intention is the manuring it for a grain crop, such as barley, which is that of eating the turnips on the land, by means of portions being hurdled off as wanted after they have been eaten up pretty clean. In this way the farmer has less trouble, and the great benefit of having the land well manured; but it is only capable of being practised on quite dry soils, as in other circumstances the sheep do much injury by poaching. Besides, the food from its being dunged, trampled, and staled upon after being partially consumed, is in some measure wasted, and does not go so far as in being eaten under the former circumstances. The chief difference is, however, in the manure in one case being left upon the pasture, and in the other upon the arable land, in the latter of which the farmer is saved the trouble and expense of putting it on previous to the grain being sown. In either case, whatever the land may be, great improvement is effected under such management.\*.

It has been observed by the same writer, that "in some parts of the kingdom, the best farmers give their ewes and lambs bran and oats, or oil-cake, in troughs while they are feeding on turnips;" but it is remarked that "it must be a good breed for such a practice to repay." When the weather is extremely wet or stormy, or there is much snow upon the ground, the ewes and lambs should have hay given them in baits as may be necessary. This is best done in covered moveable racks, a portion being given fresh every day†. If shelter can be provided with convenience, it will always be of much benefit to the sheep. The practice of letting them to the hay-stacks, which is common with some farmers, is slovenly and wasteful, and which, though it may afford a degree of shelter, should never be attempted where the other methods can be had recourse to. It has been

\* Young's Farmer's Calendar.

† Ibid.



suggested as an excellent method, though not essentially necessary, to allow the sheep, whether the weather be bad or not, a small proportion of hay daily while at turnips\*. By this careful management and the use of stubble turnips when necessary, the ewe and lamb-stock may be well supported through the severity of the winter, and be brought on in the best possible condition until the turnips are finished in March, which should always be the case, when the preserved grass or rouen may be ready to receive them, which is considered by some as the most to be depended upon through this and the following month, which with the first week in May is the most difficult period of the year to the stock-farmer. On dry meadows and pastures it is invaluable in this view, though at first sight it may have an unpromising appearance from the covering of decayed autumnal grass that is upon it, but which when removed presents a new growth of fresh green grass, five or six inches in height, brought up by the shelter and warmth afforded by the covering of old grass. This is found to agree remarkably well with the sheep, as they consume both together, having, as it were, both hay and grass in the same bite†. It is supposed by the same correct agricultor, to be impossible “to keep a full stock of sheep so cheaply in April by any other method as by this. Tolerable rouen will carry ten ewes an acre with their lambs through the whole month. Such rouen may be worth in autumn ten or twelve shillings an acre; in April it is worth thirty or forty shillings; and if it be a backward season, a farmer that has it would not be tempted to sell it for much more‡.” But in the support of his sheep and lamb-stock, if the farmer be provided with a sufficient extent of watered meadow, he may fully depend upon that without any other provision for this period.

But in cases where these cannot be depended on for the support of the sheep-stock at this difficult season, the improved practice is, instead of depending on turnips and hay with rye sown for the purpose, the young wheats and the run of the pastures, to let the turnips continue so as that their shoots may become an object of sheep-food, and to have annually a portion of tolerable good land sufficient to the extent of the flock, under rye-grass and clover, so as to be ready in the spring to take the sheep from turnips, and support them till the period of turning upon the pastures. It is remarked that “this conduct is an improvement on the other, as it gets rid of three great evils: depending on rye, which is soon eaten; feeding on wheat, which is pernicious to the crop; and turning too soon into the general pastures. But at the same time that it effects this advantage, it is open to some

\* Young's Farmer's Calendar.

† Ibid.

Ibid.



objections, which make further improvement necessary. Keeping the turnips long in the spring is very bad husbandry. It damages greatly the barley crop, both in robbing the land, and preventing it from being sown in proper time: nor is the food of great consequence; for many acres of turnip-tops are requisite, the number of which must be in proportion to the stock of sheep; and as to the roots, they grow so sticky and hard after the tops are at all advanced, that their value is trifling. With respect to ray grass, the clover mixed with it is seldom above three inches high at this season; and a great breadth of ground to a given flock must be assigned to keep the sheep through April. The number of acres of that young growth necessary to keep a hundred sheep and lambs is surprising; so that these farmers, although they manage to spring-feed more sheep than the worst of their brethren, yet effect it at a great expense, and at last not in any degree comparable to what might be done. A turnip should never be seen on the ground after March. For the month of April the farmer should have a field of cabbages ready, which, yielding a great produce on a small breadth of ground, reduces the evil of a late spring sowing; and, if he manages as he ought, totally excludes it. The turnip-cabbage, and ruta бага, will last as long as wanted; and, though it runs to seed, yet the bulb will not be sticky. The green boorcole may be fed off several times. It is impenetrable to frost, and will make shoots in the winter."

"Another crop for feeding sheep in spring, which is of particular merit, is burnet. An acre of it managed properly, will at this season yield much more food than an acre of clover and ray-grass. It should be four or five inches high in November, and left so through the winter. Burnet has the singular quality of maintaining its green leaves through the winter; so that, under deep snows, you find some luxuriance of vegetation. From November to February the crop will gain two or three inches in growth in the young leaves, and then be ready for sheep. It will be better in March, and, if kept, ready in April, not only for sheep, but horses, cows, or any other stock\*."

By these means, the sheep and lambs may be continued in good and healthy condition, which is of great consequence to the stock, till the time of turning upon the pastures, when they should be separated, where the farms are inclosed into suitable divisions, in proportion to the quantity that each pasture which they are to occupy can support, care being taken not to over-stock the fields, though hard stocking in some cases may be useful†. By some managers they are put upon the

\* Young's Farmer's Calendar.

† See Stocking of Pastures.



best pastures of the farm, while others let them have those of the inferior kinds. Each method may have its advantage under different circumstances; but the main object, that of having the stock preserved in good condition, is never to be lost sight of. In keeping sheep on inclosed pastures, particularly where the lands are much occupied with wood, constant care is necessary in order to guard against the mischief of the fly, as its effects are often irremediable in the course of a very short time in such situations, if not attended to, in hot seasons.

The weaning of the lambs is a business that should be attended to some time in the course of July, but it is accomplished more early in some districts than others. In order to effect this in the best and most advantageous manner, a proper reserve of some fresh pasture grass where there may be a good bite for the lambs to feed upon should be made. It is of much consequence that an ample provision of this nature be had, in order that the growth of this young stock may not suffer any check on being taken from the mother. Some advise clover in blossom as the most forcing sort of food in this intention. And saintfoin rouen is highly valuable for the same purpose. The ewes should be removed to such distant pastures or other places as that they cannot be heard by the lambs, and thereby cause them to be disturbed in their feeding. And where the ewes sustain any inconvenience from their milk, it should be drawn once or twice, as by this means disease may be prevented\*. After the lambs have been removed, the ewes are returned to the situations destined for their summer support.

As it is necessary in the common management of sheep-stocks to remove a certain number of the crones or old ewes annually, and replace them by the best lambs, in order to keep them up in the greatest perfection, it is of considerable importance to have the business performed in a proper manner. In most of the sheep-districts in the southern parts of the kingdom, this selection or setting of lamb-stock is usually made about the month of August, when the fairs for the sale of lambs mostly take place. And as the whole are then collected for drawing into different lots, it may be a very suitable period for selecting those that are to supply

\* It is observed in the Northumberland Report, that "when this practice, as was usual, is continued to eight or ten weeks, it becomes very detrimental, keeps the ewes lean, and ill prepared for meeting the severities of winter.

"This custom has been long disused by the intelligent farmers in the lower districts; and much laid aside by the most considerable hill farmers. The profit of milking ewes for six or eight weeks is estimated at 8d. per ewe; and it is generally agreed they are decreased in value at least 1s. 6d. per head; of course there is a loss of about 1s. per head by milking. In one instance of milking long-woolled ewes there was a loss of at least 3s. per head."



such deficiencies in the breeding stocks. It is observed by Mr. Young in his excellent Calendar of Husbandry, that “in making this selection the farmer or his shepherd usually (whatever the breed may be) rejects all that manifest any departure from certain signs of the true breed: thus, in a Norfolk flock, a white leg, and a face not of a hue sufficiently dark, would be excluded, however well formed; in the same manner a white face on the South Downs; in Wiltshire a black face would be an exclusion, or a horn that does not fall back; in Dorsetshire a horn that does not project, &c. &c. And where the produce is annually sold lean, there is reason in all this; for customers who have been used to, and prefer certain breeds, as having paid them well, are apt to be fastidious when they purchase. Some farmers in this selection look chiefly at size, always keeping the largest frames; but this is probably erroneous, unless they *keep* very high. It connects with a question by no means ascertained, whether sheep do or do not eat a quantity of food proportioned to their weight? In general, it is a safer rule to choose a well-formed lamb, or that indicates the probability of making a well-formed ewe, rather than to select for size. The attention that is to be paid to wool, in the breeds that produce the carding sort, will depend on the price to be received: if the farmer lives in a district where the price of the year is given equally to all flocks, there is little encouragement to lessen quantity for the sake of quality; retaining, however, in idea, the fact that both are attainable, that it is very common to see coarse *breeched* sheep with light fleeces, and those of a fine quality heavy in weight. The Spanish fleeces, which are finer than any other, are heavier than those of our finest-woolled sheep. With combing wool the importance of the fleece depends still more on price; we have seen it at 8s. a tod; and it has lately been 36s. Quality is of very little consequence indeed, compared with quantity; and when wool sells high, no prudent breeder will set his stock without being governed considerably by this object.

“The high prices at which new Leicester and new South Down rams let and sell has opened a field of speculation in sheep-breeding. It is sufficient to remark, that this spirit of breeding, whether it shall prove durable or not, whether much money shall or shall not be made in it in future, is not what any prudent man beginning business will adventure in but with great caution: men of such immense fortune are now taking a lead in it, and are in many respects doing it on such liberal principles, that the wisest conduct of such farmers as he may be supposed to address, is to take proper opportunities of converting their experiments to their own (the



farmers) profit. Leave the expense to them; but, when you can, convert the profit to your own advantage. In setting a flock of lambs, therefore, you may mark a score of the best, for a future ram to be picked up when opportunity offers; or, better still, to send to the tup of some ram-letter that takes them in at a reasonable price per head. By every year selecting five or six per cent. and by every year covering that number by a ram better than any of your own, the flock must be on the improving hand; and this may be done at a very small expense."

And as this is not only the proper period of filling up the deficiencies in the ewe-stock, but also for increasing or diminishing the quantity of stock, by reserving a larger or smaller number than that of the old sheep which are disposed of, it is a matter that demands particular attention. The following useful directions are given in the same intelligent work: "On a farm with a given stationary sheep-walk, it is probably regulated by circumstances that rarely change; but, on inclosed farms, where the sheep are supported by fields alternately in grass and tillage, variations may easily be supposed, and the question of hard or light flocking, that is, of close feeding or a head of grass, then comes in to decide the number kept. If the produce or profit per head is looked to, the conduct to be pursued is evidently to stock lightly; but if the return is looked for in corn from fields laid down for refreshment by rest, then close feeding is a very material point, and the number kept will depend on it. With all the grasses, &c. that do not decline from age, the more sheep you keep the more you may keep, and the more corn you will reap when such are ploughed; a circumstance too important to be forgotten. But the young farmer will remember, that upon this system he must not have a *show* flock, or let the vanity of a farm have the least influence with him: if in this way he will have something to talk of, a score or two of pampered favourites, the fewer the better, for they may cost him more than they are worth."

After this business has been properly executed, the ewe- and wether-lambs which remain are usually sent to the neighbouring lamb-fairs to be disposed of. But where the fairs for this purpose happen later than this period, as in the beginning or latter end of September, as is the case in some places, Mr. Young advises that "great care be taken to keep them in forcing food, as in spring-tares, early-sown rape, good grass of the right degree of bite, &c. &c. in order to promote their growth and increase their value; but to sell in August is more beneficial."

In the down- and mountain-sheep there is some difference in the management from that of those on the inclosed lands, though the same attention in the selecting



and choofing of the breeding- and ram-stock is now mostly practised with the better and more enlightened sheep-farmers in such districts.

In the former situations they are perfectly aware that, besides the improvement of their tillage lands, their sheep can be rendered of considerably more value; a circumstance which has had the happiest effects in promoting improvements in this department of husbandry. The chief difference in the method of keeping them, is in their being turned upon the downs, heaths, or commons, as early as possible in the spring season, as about the middle of April, and kept there till the beginning of autumn, as in October; the short sweet nutritious herbage in these situations affording them a supply of food sufficient to keep them in tolerable order. But when this keep begins to decline the farmers have recourse to other sorts of food, the sheep being usually folded on turnips or cole, on which they are continued during the winter until they are expended, when they are chiefly fed with hay, stacked for the purpose on the downs or other places, till there is again a sufficient bite of grass. In these cases the practice of folding is mostly in use throughout the year; which during the summer and autumn is mostly on the lands under preparation for wheat-crops, but in the winter occasionally on the stubbles, though more generally on the downs and pasture; and in the spring on the grounds that are destined for the barley crops\*.

In some of the more elevated and hilly districts in the northern parts of England, where sheep-husbandry is conducted on an extensive scale, the sheep on being divided, under the care of different shepherds, into old sheep, such as wethers and two-year olds, and breeding and young sheep, the former are put upon the more elevated and exposed pastures, and the latter on those that are more fertile and sheltered, being well supported in the winter with turnips and hay†.

There is another inferior sort of management in these situations, which is that of permitting the flocks to range over the hills and commons during the summer season, mostly without being under the command of any shepherd. About the close of this season, or on the approach of winter, they are collected together, and brought home in order to undergo the operation of *smearing* or *salving*‡, which is common in these districts, though it does not prevail, we believe, in the sheep-husbandry of any

\* Donaldson's Present State of Husbandry in Great Britain. † Ibid.

‡ This is an operation that was formerly considered as indispensable to the health and safety of sheep. But in the southern parts of the kingdom, according to the Survey of Northumberland, it is not in use, and in some of the less exposed northern districts it is wholly in disuse; even with some of the hill-sheep farmers it is now laid aside without any inconvenience being sustained.



of the more southern parts of the island. After this work has been performed the old stock-sheep are returned to their former situation, and, in some cases, the hogs and other young sheep with them. But in other cases a better management is pursued; in some instances, where the nature of the farms will admit of it, these last sorts being wintered in the inclosed pasture grounds that are near to the houses: and in other places, what are termed the home-grounds, whether open or inclosed, are purposely preserved or saved during the summer season, in order to admit the whole flock to be supported on them in the winter. When these are not sufficient for this use, others at a distance are frequently provided. In severe seasons, some hay or straw is likewise given daily\*.

In the sheep-districts in the most northern parts of the kingdom a still less eligible management is in use: the flocks are in common left to provide for themselves, even in the most severe and inclement seasons, when the bleak tracts on which they live are covered deeply with snow. In these cases the sheep have their chief dependence for subsistence on their own habits, which lead them to remove the snow by their feet with great facility till they reach the heath or withered herbage.

The substance employed in this district is a mixture of 12lbs. of butter with four quarts of tar, well incorporated by being put together while warm. This quantity is sufficient for twenty-four sheep. In Perthshire in the north of Scotland "the composition now in use is likewise tar and butter. Some take ten Scotch pints of tar to a stone of butter; others only five pints of tar to that weight; and others in the various proportions between these extremes. This quantity sufficeth for laying fifty-five or sixty sheep, at the rate of three or four pence each, according as there is more or less tar in the mixture. Formerly shepherds used tobacco-juice and soap, and in some cases chamberley; but these are laid aside as less efficacious."

The business is in some places done in November. In Perthshire, the store-masters smear their lambs about the beginning of October; and if the weather be favourable, they continue the work, without intermission, till all the sheep, they intend, be smeared. In some places they smear only the weaker sheep; in other places the whole. One man smears twenty or twenty-four in a day, leaving about an inch betwixt every shed of the wool.

The benefit expected from this practice is, that it makes the sheep hardier and warmer, that it cleans them from vermin and cutaneous distempers, and that it prevents their losing the wool. They contend further, that the wool pays very nearly the whole expense, the same number of fleeces of smeared and white wool bringing an equal sum in the market, because what the smeared wool wants in quality it has in weight: and lastly it is urged, that "the more butter there is in the composition, the grain of the wool is softer and more silky; that by the practice of smearing, the young sheep are raised in the bone, are preferred in the market, and fetch a better price."

But, "notwithstanding all those arguments in favour of smearing, others condemn the practice totally. There is little doubt that it forms a crust about the animal's body, and contributes to defend it from the cold, and thus it may be proper in a stormy situation while it is unnecessary where there is plenty of shelter."

\* Donaldson's Present State of Husbandry in Great Britain.



When the snow is falling or blown by a storm, the shepherds, however, drive the flocks, without intermission, round the top of a hill in a circle, in order to keep them from lowering and being drifted up or smothered. It is likewise the practice in some countries to erect circular folds on the tops of low hills for the same purpose: and when the heath is all covered, they sometimes harrow the snow in order to bring up the heath; for which use the harrows should only have few but long teeth. Some have recourse to feeding with hay or unthrashed oats in handfuls upon the snow\*. But as these only afford a precarious support, a proper winter food, well suited for their use and adapted to such situations, would be of the greatest value and utility. It has been suggested by Mr. Marshall, "that cultivating plots of furze, broom, juniper, &c. by sod-burning, and rippling the surface, or by other more eligible means, could not fail of proving beneficial upon the wintering grounds of a sheep-farm. By means of these, as a resource in the deepest snow, when the herbage of the *braes* was buried too deep, and too evenly to be uncovered by the scraping of the sheep, by keeping the most exposed parts of the *braes* in full herbage for less general coverings of snow, and by reserve of rape for the season of lambing, even ewe flocks might be supported through the winter with some degree of certainty, without dry fodder, and without being left to the uncertainty of the seasons, and the mercy of the winds and weather, as they are at present."

The produce or profit of keeping sheep must obviously differ very considerably according to the circumstances under which they are conducted, the nature of the breed that is employed, and the goodness of the management pursued in keeping them. There are so many causes that affect the profits in this sort of husbandry, that it is probable no two sheep-farmers have exactly the same returns.

In the Annals of Agriculture†, several detailed statements of the advantage of sheep-husbandry, when conducted on an extensive scale, are given with much clearness and accuracy. In Suffolk, according to Mr. Macro's account (which was not made directly with the view of showing the profit that may be derived from sheep, but the disadvantage of a stout flock), the profit on 494 ewes is £.16, or 8d. per head.

But in Suffex, in Mr. Ellman's statement, on 560 ewes it stands at £147, or 5s. 3d. per head.

And in the Duke of Grafton's estimate on 40 score it is £.134, or 3s. 4d. per head‡. From the late improvements in sheep-husbandry, it is probable that the

\* Perth Corrected Report.

† See Volumes II. VII. and XI.

‡ See Grazing.



present estimates stand much higher. The profits in the different systems of fattening sheep have been already stated\*.

Where the system of folding is practised, the sheep most adapted to the business are those of the more light and active short-woolled breeds, as the Norfolk, Wiltshire, South-Down, and some other kinds. This management has been hitherto considered as almost absolutely indispensable in many situations to the success of the farmer. It is, however, stated by Mr. Young, in his Calendar, that “a very great change has taken place on inclosed farms in the practice of the best farmers, especially in Norfolk. They are now fully convinced, that it is an unprofitable practice, except where the openness of downs and common fields renders it necessary for the purpose of confinement. The number of sheep that may be kept on a farm without folding is much greater than can be supported with it. This is a very essential point. There is a deduction from the farmer’s profit, in the injury done by folding to both ewe and lamb, which has been estimated by experienced judges at from 2s. 6d. to 4s. per ewe; so that a farmer should consider well, before he determines to follow a practice which, from a multitude of observations, is pronounced unprofitable. Mr. Bakewell used to call it robbing Peter to pay Paul. The arguments now used in its defence are not satisfactory: it is contended, that if sheep be not folded they will draw under hedges, &c. for shelter in bad weather; if so, they ought to be allowed to do it, for more would be lost in such cases by forcing the sheep from shelter than the value of their fold. Where this practice takes place, good shepherds will, in case of rain, get up in the night and let their flocks out of fold, knowing the consequence of confinement on arable land in wet weather. The instinct of these animals will conduct them much better than our reason, not only where to fly for shelter, but also for choosing their own time to go to rest, and to feed in the morning. These they vary according to seasons and weather; but folding prevents it, and forces them to a regularity never called for by the weather.”

It is remarked, that “when he began first to entertain doubts of the propriety of folding sheep on any farms in which they can be kept to certain fields in the night, without that practice, he desired earnestly to try some experiments that might throw more light on the question than it was possible for reason to do; but to effect this comparatively was very difficult, as the trial he wished for was such as should carry some positive conviction with it. He has not been able

\* See Grazing.



to effect it fully ; but the trials he has made may not be found destitute of power to throw some light on this interesting question. He is perfectly persuaded, that it would have been impossible for him to have kept on the same land nearly such a flock in one parcel with folding. He does not conceive that the fields would have carried three-fourths, so managed. Four drivings in a day make them trample much food, disquiet the sheep, and transfer the choice of their hours of feeding and rest from themselves to the shepherd and his boy. While lambs are young they are injured by this, and the ewes are liable to be hurried and heated ; all which are objects that should weigh in the question. When sheep are kept in numerous parcels, it is not only driving to and from the fold that affects them, but they are, in fact, driving about in a sort of march all day long, when the strongest have too great an advantage, and the flock divides into the head and the tail of it, by which means one part of them must trample the food to be eaten by another. All this points the very reverse of their remaining perfectly quiet in small parcels. But the question turns on the benefit to be reaped by the fold ; for, if that be great enough to compensate for the loss by such circumstances, the practice may not be condemned."

Mr. Young suspects that " the reason why farmers are such warm advocates for folding, arises from the power it gives them of sacrificing the grass lands of a farm to the arable part of it. Their object is corn, by which they can carry off a farm whatever improvement they bring to it. Grass improved is profit to the landlord in future ; and tenants are too apt to think that this is done at their expense. They do not at all regard impoverishing a grass field in order to improve a ploughed one ; and he need not observe, that every sort of sheep-walk is thus impoverished ; so that antient walks, which have been sheep-pastured perhaps for five centuries, are no better at present than they ever were before ; whereas most fields sheep-fed, without folding from them, are in a constant state of amelioration : this leads him to remark the effect he observed on several of his own fields. He attended through the course of a summer many gentlemen over his fields, with a view to examine whether the sheep had seemed to have rested only on spots, to the too great manuring of such ; or, on the contrary, to have distributed themselves more equally ; and it was a pleasure to find, that they seemed generally to have spread in every part, if not quite equally, at least nearly so. The improved countenance of several old lays fed in the same manner, when examined in autumn, convinced him as well as his bailiff, that the ground had been unquestionably improved considerably. Those fields had carried a very bad appearance for some years ; but they were, after



sheep-feeding, of a rich verdure, and as full of worm-casts as if they had been dunged. He rolled them heavily in November, but they soon became rough again by worms, and demanded much rolling in spring. They had afterwards a greener and more fertile appearance by far than ever they wore before."

It is concluded "that the whole of this circumstance, the value of which he will be able to appreciate in the trials of future years, belongs to this method of dividing flocks, to the exclusion of folding. The fold is valuable, but so is the improvement of the grass land, and may, for what he knows, nearly equal it: when, in addition, we include the greater number of sheep that can be kept, and the favour done to them by letting them alone, there remains in his mind no further doubt of the fact. It is common to hear flock-farmers in open countries say, they have not the power to manage so. This may be very true, upon the major part of the farms; but such have often many inclosures, in which this management might be applied without difficulty. But if we suppose folding to be the system pursued, he may remark, that the farmers in those parts of the kingdom which understand it best, do not extend it so far as they might; they give over folding in November or December, whereas it may certainly be carried on through the whole winter with profit; even supposing that the practice is *necessary*: on those farms which have a perfectly dry gravelly pasture or two, it is advisable to fold all winter on such dry grass land. It must not be attempted on moist arable land, nor on moist grass land, but on dry pastures. The safety to the sheep is greater, and the benefit to the grass an object."

These are the arguments and experiments by which the utility of this long-established practice is assailed and rendered problematical, at least on farms in inclosed districts, where the sheep are capable of being confined in the pastures or other fields in separate lots without this management. How far, in other cases, the injury sustained by the sheep in their thriving, and being more exposed to disease, with the trouble and inconvenience of the practice, weigh against the advantage of the system in providing manure as well as otherwise improving the tillage lands and keeping them in a more restrained state by other means, remains to be shown. The decision of the question involves various considerations of great moment to the stock- as well as tillage-farmer.

It has been suggested, that "there is another method of gaining all the benefit of folding quite through the winter, and on all soils; this is, to confine them at night in a sheep-yard, well and regularly littered with straw, stubble, or fern; by which means you keep your flock warm and healthy in bad seasons, and at the



same time raise a surprising quantity of dung; so great a quantity, if you have plenty of litter, that the profit will be better than folding on the land. A great improvement in this method would be giving the sheep all their food (except their pasture) in such yard; viz. hay and turnips, for which purpose they may be brought up not only at night, but also at noon, to be baited; but if their pasture be at a distance, they should then, instead of baiting at noon, come to the yard earlier in the evening and go out later in the morning. This is a practice which cannot be too much recommended; for so warm a lodging is a great matter to young lambs, and will tend much to forward their growth; the sheep will also be kept in good health; and, what is a point of consequence to all farms, the quantity of dung raised will be very great. If this method is pursued through the months of December, January, February, March, and April, with plenty of litter, one hundred sheep will make a dunghill of at least sixty loads of excellent stuff, which will amply manure two acres of land, whereas one hundred sheep folded (supposing the grass dry enough) will not in that time equally manure one acre."

This business may be still further promoted by means of proper yards suited to the extent of sheep that are folded, with sheds on the sides for them to feed under; as in this way, by having the bottoms and under the sheds well covered with turf, bog-earth, marl, or the scrapings of roads, in the autumn and winter season, the sheep being kept on them in the day-time in bad stormy weather, and always during the night, with plentiful supplies of straw, stubble, fern, or any similar substances as litter, so as that they may be preserved quite dry and free from moisture, a vast stock of good manure will be raised. Such yards or standing folds, on this account, as well as that of improving the wool and affording shelter to the animals, deserve to be much more general than they are at present. These yards both with and without sheds are in use in Suffex\*; with sheds they are probably better than when wholly covered, as in the Herefordshire method; for in this last mode it is probable the sheep may be kept too warm, an equality of temperature being found of the most benefit in the economy of these animals. More experiments than have yet been made are wanting to show the advantages that may be derived from different methods of housing sheep during the winter season. There seems little doubt but that the quality of the fleece may be improved by it, though in the French manner it is said to have done harm†.

Wherever the system of folding is adopted as necessary, it should be pursued with

\* Annals of Agriculture, Vol. XI.

† Annals of Agriculture, Vols. XI. and XVI.



as much steadiness as possible, and have the business done in a perfect manner, for which purpose it may be sufficient to allow two square yards, or, in many cases, a less space, to each sheep, having them to remain two nights or more on the same spot; though the usual practice is to let them have more room, and remain a less time on the land. On tillage lands the surface should be very thickly covered over; but when in the state of sward a slighter coat may be sufficient. The lands under fallow for turnips or cabbages are in general best to begin upon, as the crops will be ready to be put in almost immediately afterwards. From these the farmer may proceed to the grounds in preparation for other crops, as the wheat fallows, being constantly attentive to put his sheep upon such lands first as are to be first sown, whether with grain or grass seeds. When on the approach of the winter season the weather becomes too wet for pursuing this system on the arable lands, it should be transferred to the pastures or other grass lands; as on dry lands of this kind this management may be continued without much harm to the sheep, and much improvement in the land be effected. Where there is much moss on the lands this practice has much effect in removing it\*.

The time of clipping or shearing the sheep should be regulated by the state of the weather and the climate in the particular district, as the summer season commences much sooner in the southern parts of the island than those of the north. In this way the danger of injury by cold from depriving the sheep of their coats too soon, and from heat by permitting them to continue on them too long, may be equally avoided. There is also another circumstance that should be attended to in this business, which is, that of the wool being at the state of maturity; for if the clipping precede that period it is weak, and can scarcely be spun, and if protracted later, it is yellow, felted, and imperfect†. For the more warm sheltered situations in the southern parts of the kingdom, the beginning or middle of June, when the weather is fine, may be in general the most proper; but in the more exposed districts in the northern parts of the island, the middle or latter end of the same month may be more suitable, provided the season be favourable. But with the fattening sheep in the inclosures it will mostly be necessary to perform the work at an earlier period in every situation, as the great increase of heat from the setting in of the summer weather added to the warmth of the fleece becomes very oppressive and injurious to them in their feeding.

As the fleeces of sheep at this season become much loaded and filled with dust and

\* See Folding, in Section on the Cultivation of Arable Land.

† Annals of Agriculture, Vol. XVI.



dirt of various kinds, before the business of shearing is begun, it is necessary to have the operation of washing performed. In the old method of executing this work, by the washers standing up to the breast in the water, there is not only much inconvenience and danger, in the men requiring a large supply of spirituous liquors, being attacked with colds, rheumatisms, and other diseases, but, from the uncomfortable-ness of their situation, often dispatching the business with too much expedition, so as to leave the wool insufficiently cleaned. It has been proposed, in the way of remedying these inconveniences, that a stream or pond by a little contrivance will afford the means not only of doing the work well, but with comfort to the men. The method is to "rail off a portion of the water for the sheep to walk into by a floop mouth at one end, and to walk out by another at the other end, with a depth sufficient at one part for them to swim; and to pave the whole: the breadth need not be more than six or seven feet: at one spot let in on each side of this passage, where the depth is just sufficient for the water to flow over the sheep's back, a cask, either fixed or leaded, for a man to stand in dry; the sheep being in the water between them, they wash in perfection, and pushing them on, they swim through the deep part, and walk out at the other mouth, where is a clean pen, or a very clean dry pasture to receive them. Of course there is a bridge rail-way to the tubs; and a pen at the first mouth of the water, whence the sheep are turned into it, where they may be soaking a few minutes before being driven to the washers\*."

Before this work commences the lambs should be separated from the ewes and other sheep, and each placed in separate pens. When the forme are washed, it is seldom necessary to do much more than allow them to be just swilled through the water.

After this operation has been accomplished, the sheep should be provided with a dry clean pasture for a few days until they become perfectly dry, and are in a proper state to be shorn or clipped.

In the former method of performing this sort of operation, it was the custom of the shearers to perform the work length-ways of the sheep; and in many cases it was very indifferently executed, so much so, that it has been supposed that one or two ounces of wool were left, upon the average, upon each sheep, and by that means much injury done to the following growth, as it is conceived that wool in this particular has much resemblance to grass, and "will not thrive well if it be not cut close." This imperfection in the clipping of sheep is believed to arise in a great

\* Young's Farmer's Calendar.



measure from the longitudinal method of performing the operation. The improved practice is therefore to clip circularly round the body of the sheep, by which means the work is believed to be more evenly as well as more closely executed. It is suggested, as probable, that the first inducement to this method of executing the business was that of improving the beauty of the animals\*. It is not unlikely but that convenience might also have some share in the introduction of this improvement, as it is extremely awkward and unpleasant for the operator to clip large sheep in the longitudinal method. The origin of this mode of shearing sheep is given, by Mr Young, to Lincolnshire, whence it is supposed to have passed into Leicestershire. And it has since that period been introduced among the Suffex sheep-farmers with much attention by the Earl of Egremont; while the late Duke of Bedford and Mr. Coke have not been less assiduous in making it known in Bedfordshire and Norfolk †. It is therefore probable that it will not long be neglected by the sheep-farmers in those districts where it may be yet unknown.

In managing this sort of business, besides the clippers, who are mostly persons that undertake the work, it is necessary to have a man to every three or four clippers, to draw and turn up the sheep ready for the operation. The business is mostly performed in a barn or other shady situation. Expert clippers seldom or ever cut or in any way hurt the sheep; but where they are not well accustomed to the work this may easily be the case, and much injury be done: it is of course necessary to be cautious in engaging persons for this sort of work. The number of sheep that can be clipped in the course of the day by an expert operator must vary according to circumstances, but in general it is supposed to be about forty.

With the grazier, where this sort of work is on a very extensive scale, it is mostly the custom to have the work performed by the number. The usual price is from 2s. 6d. to 3s. the score, the clippers drawing their sheep ‡. But with less extensive sheep-farmers the work is often performed by the day, in which case 2s. 6d., with meat, strong beer, liquors, &c. is the common price for each person §. Mr. Young states the price in common clipping at "from 2s. 6d. to 3s. per score, for washing, clipping, and winding, labour being at 1s. 6d. a day." At present we believe the expenses run higher than these statements.

It is necessary to have a proper person to wind the wool after the shearers, who should perfectly understand the business, as much in the sale depends upon this being well done, and that no improper substances be inclosed in the fleeces, as

\* Young's Calendar.

† Ibid.

‡ Synopsis of Husbandry.

§ Ibid.



where this happens the farmer may find difficulty in disposing of his wool in future.

Mr. Ellman, an extensive South Down sheep-farmer, clips off the coarsest of the wool on the thighs, and docks a month before the time of washing and shearing, which he sells, as locks, at 3 $\frac{1}{2}$ d. per lb.; the quantity being about four ounces per sheep. He finds this method to answer very well, keeping the sheep clean and cool in hot seasons. It is a practice in many other districts with other breeds of sheep, and is found to have many advantages, not only keeping the animals clean, but in ewes preventing their becoming sore in the udder\*.

Some have suggested the cutting or clipping of long-horned sheep twice or oftener in the course of the year, about January and June, as by this means they suppose that there would be an advantage in having the second cutting much finer, and if well kept the sheep would probably sustain no injury†. In an experiment made by John Askew, esq. of Billingsburn in Northumberland, the first clipping was performed on the 9th of February, and the second on the 24th of June, the ewes being sheltered and fed with a little oats for some time afterwards; the result was, that both the ewe and the lamb continued in the best condition of any in the flock, and the quantity of wool was increased; the first clipping affording seven pounds and a half, and the second three pounds and a half, making together eleven pounds; while in a year's growth clipped at once the weight was only nine pounds. The quality was likewise so much improved, that the second clipping was worth eight shillings a stone more than the first. And it is suggested, that as the four months' growth was exactly of the proper length for carding, the long-woolled sheep, instead of twice, may be clipped three times in the year‡.

The clothing of sheep has likewise been attempted with a view to the bettering of the wool. In Mr. Brodie's experiment in this way the improvement in the wool is said to have been very great. The expense about seven-pence per sheep for two or three years. By combining this practice with the above, it is supposed that the combing-wool may be converted into that of the clothing kind, and that while the quantity and quality of the fleece is improved the carcase of the sheep may be much benefited§.

The experiments on these interesting points are so few, and the expense of such management so little detailed, that no satisfactory conclusion can probably yet be

\* Corrected Report of the North Riding of Yorkshire.

† Annals of Agriculture, Vol. XV.

‡ Ibid. § Ibid. Vol. XVI.



drawn. It should not, however, be forgotten, that it has been in general conceived, that a certain maturity in the wool was necessary to its perfection, and that in the economy of sheep an over degree of warmth may be equally detrimental with too great a deficiency of it.

The lambs are usually clipped or shorn a month or six weeks after the operation has been performed on the old or store sheep. When this business has been done, both the old sheep and lambs should be marked with ochre or some other substance; and with some it is a practice to mark them in the ear or other part. It has been objected, that by marking with tar injury is done to the wool, but Mr. Macro has shown in the Annals of Agriculture, that the quantity employed does not amount to an ounce per sheep, so that no great inconvenience can be sustained by it.

It is a practice in some districts to dock the tails of sheep, which has probably originated in the idea of keeping the animals more clean, and free from the attacks of the fly. Some, however, conceive it improper, as preventing the sheep from being able to beat off the flies in hot seasons\*.

The *castrating* or *gelding* of the male lambs is performed at different ages in different districts; but it seems the most proper to be done in the first fortnight in the stronger sort of lambs; and in those of the weaker kind from a fortnight to three weeks, or a month old, according to circumstances. Some, however, advise its being done at a much later period. While done early, there is, however, the least danger of too much inflammation coming on, if the lambs be in a healthy condition. When performed while very young on tender delicate lambs, mortification may, however, sometimes be apt to come on and destroy them.

The produce in wool differs greatly in different breeds of sheep; but in the pasture or long-woolled kinds the quantity is very considerable, though very inferior in quality, to that of many of the short-woolled sorts. The finest wool is produced from the Shetland, the Herefordshire, and the South Down, of any of the native sheep, and the greatest quantity from the Lincolnshire. The quality and quantity afforded by each sort of sheep has been already noticed in speaking of the particular breeds of sheep.

It is observed by Mr. Donaldson that, "the wethers have considerably more wool than the ewes. In the fleeces of either there are several qualities; some reckon eight or nine different sorts. These are all separated from each other in England by a set of men called woolstaplers, who are appointed for the purpose,

\* Annals of Agriculture, Vol. IX.



and who are sworn to do justice between the grower and the merchant or manufacturer.

The business of the shepherd is considered by the same writer as "very important; as on his due care and unwearied attention depend in a very great degree the welfare and value of the flock, and consequently the profit of the owner. The business of a shepherd is to superintend the flock at all times, and more particularly at the lambing season, to take care that no improper tup intrude at the season of copulating; to determine the proper time for shearing or clipping the fleece; to draw out such sheep as are in condition for the grazier or the butcher; and such also, as from age or deformity, are improper to be kept longer in the flock. He ought also to have a competent knowledge of the diseases of sheep; of the proper remedies to be applied, and of the modes of application. In short, he ought to be diligent and attentive; a competent judge of the good properties which the particular breed of sheep of which he is to have charge ought to be possessed; and he should also, especially where the breeder is the grazier, be able to determine with precision what part of the flock is, and what is not, in condition for the butcher."

The usual method of ascertaining the age of sheep is, as in cattle, by their teeth; they are also denominated one shear, two shear, &c. according to the number of fleeces that have been shorn from them. A sheep of one shear, or of one year old, has two broad teeth before; a two shear sheep has four; a three shear, six; and a four shear, eight, when it is said to be full mouthed. After four, the teeth begin to break, shorten, and fall out. Sheep of different kinds and ages are also known by many other names in different districts.

Sheep are liable to a great variety of diseases both external and internal, and their nature highly deserving of inquiry, but the subject is much too extensive to be fully considered in this work.

The *Fly* is a disease to which sheep are constantly exposed in hot seasons, especially in inclosed woody districts. Various remedies are in use for the prevention of the effects of this dangerous insect. On the principle of its avoiding certain substances various applications have been made; but that which is found the most effectual, with the least injury to the wool, is the flowers of sulphur in combination with some sort of greasy substance, such as lard, or butter, which can be drawn thinly over the wool by the hand. Where maggots are formed it has been advised, instead of cutting the wool off the part affected, and scraping them off with the points of the shears, that the wool should be parted, and "the maggots picked out with a knife, or otherwise dislodged, without breaking the coat; and a quantity of white-lead scraped from a lump among the wool; which being agitated,



the powder is carried evenly down to the wound. Too much discolours the wool; a little prevents any further harm from the maggots that may be left among the wool, driving them away from the wound; and, at the same time, is found to promote its healing. In well shepherded flocks, which are seen regularly twice a day, there is no such thing as a broken coat\*.”

The *Foot-rot* is another disease that frequently attacks sheep, and which shows itself by their lameness and the oozing of moisture between the claws, with a highly disagreeable smell: as the disease advances it gets under the hoof, throwing out proud flesh. It is supposed infectious, from its spreading rapidly when not immediately eradicated. The part should be pared and cleaned without touching the quick, and the gravel dislodged, if there should be any, as soon as the disorder is discovered; the sheep being removed from the rest of the flock. A solution of the following ingredients should then be dropped on the part, and the foot be kept dry and free from dirt:—two ounces of blue vitriol, the same quantity of roch-alum, one ounce of verdigrease, and a quarter of an ounce of muriated quicksilver dissolved in a quart of good distilled vinegar †.

The *Scab* is a cutaneous disease, something like the itch. When mild, and the cure attempted in time, washing with tobacco-water will often remove it without risk. And sulphur ointment still more effectually.

But when the disease is more virulent, the cure is often attempted by the application of the common blue ointment of the shops, composed of quicksilver and hogs'-lard, in the proportion of two ounces of quicksilver to sixteen ounces of lard: a pound of the ointment being sufficient for four sheep. The greatest caution should however be used in applying this ointment, especially with ewes that have lambs, as the latter are liable to be destroyed by being salivated. It should be laid on very sparingly in sheds at four or five inches apart.

The *Rubbers* are a sort of itch, in which the animal rubs itself to death, being gradually exhausted in consequence of not being able to feed. No effectual remedy has yet been discovered ‡. The above may be tried.

Sheep are very liable to be affected with *blindness* from cold, and of course exposed to much danger from ponds, precipices, &c. The cure is sometimes attempted “by opening the vein below the canthus or inner angle of the eye, called the angular vein, then, by holding the creature's head in an inverted position, to make

\* Rural Economy of Midland Counties.

† Corrected Report of the North Riding of Yorkshire.

‡ Lincolnshire Report.



some drops of the blood fall into the eye, which operate two ways in effecting a cure of the *ophthalmia*; first by moderating the increased action of the vessels of that part, which is the proximate cause of the inflammation; and, secondly, the blood being admitted into the eye of the animal will act, by reason of its mildness and its warmth, as an emollient, which also contributes towards a cure. After this operation the white specks on the eye are removed and the sight completely restored. For this purpose some pound a little glass, that is blown into the eye with a quill open at both ends, which by its friction wears off these specks or scales\*.”

A weak solution of verdigrease in distilled vinegar has also been found useful occasionally applied by a soft feather. And it is probable that white vitriol might be used in the same way with advantage.

The *Rot* is a disease with which sheep are frequently affected on moist wet lands. It is an affection of the liver and lungs, attended with a dropsy, and hitherto incurable. The chief thing to be depended upon in these cases, is that of changing the sheep to a dry situation, or keeping them warm and sheltered, and giving them dry food in the yard†. On this subject a curious fact or two are stated in the Survey of Lincolnshire. It is observed that in rotting years, “the sheep that feed on the salt marshes, over which the spring tides come, fell very high in confidence that they are safe.” And it is added, “that a shepherd, who, when young, was shepherd’s boy to an old man who lived at Netlam, near Lincoln, a place famous for the rot, told Mr. Neve, that he was persuaded sheep took the rot only of a morning before the dew was well off: at that time they folded, being open field. His master’s shepherd kept his flock in fold always till the dew was gone; and with no other attention his sheep were kept sound, when all the neighbours lost their flocks‡.”

The *Turn* or *Giddy* is a disorder with which these animals are often seized. This is probably a species of hydrocephalus, or an encysted collection of water in the head betwixt the dura and the pia mater, which in these creatures is always accompanied with a *vertigo*, or continual turning about. In Lincolnshire, where it is termed “*sturdy* or *bladder* on the brain, there is an old fellow, near North Somercotes, who trepanns for it, and saves as many as he loses. He raises the skin with a sharp strong hooked knife over the spot affected, about the size of a crown-piece; he then raises nearly the same size of the skull-bone, letting the piece hang as by a hinge on one side; then with a quill cut slanting to a point, like a spear, and barbed on each side, he

\* Perthshire Corrected Report.

† Report of Yorkshire.

‡ Much light has been lately thrown on the nature of this disease by Dr. Harrison in his “Inquiry into the Rot in Sheep and other Animals.”



fishes in for the bladder, and brings it out whole, putting down the bone again, and covering with a plaster."

It is stated by the author of the Experienced Farmer, that pulling sheep violently by the ears, and then cutting them off, in these cases, has with him effected a cure. Sheep in this situation among the South Down sheep-farmers are said to be *paterish*\*.

The *Resp* or *Red-water* is another disorder to which sheep are exposed. It is supposed to be induced by taking too much watery or succulent food, as turnips, rape, clover, eddish, and such like rich vegetable produce. It is not peculiar to sheep feeding on turnips or rape, as has been supposed. The use of common salt and frequent driving about has been supposed beneficial; and it is said that the disorder may be prevented by having recourse to dry food in the night when the sheep are feeding on these succulent plants.

The *Braxy*, as it is termed in Scotland, and which seems to be of the nature of the *gastritis*, is probably the same disease as the above: it is said "to be not only the most fatal of all the diseases of sheep, but to have hitherto baffled all the skill and art of man. Some farms are more liable to this disease than others; and it was altogether unknown in the Highlands until they began to introduce a new breed, and to leave their sheep at all seasons in the fields. A change of grass, especially to clean grass, or clover forage, in the latter end of autumn, has often been tried successfully. The only remedy, indeed, seems to be, to try to prevent a disease which, after infection, "has in all instances been found hitherto incurable." It is found most fatal within the region of the hoar frost; as it makes less havock and is scarcely felt in situations which are more elevated and more remote from the tracts of rivers, marshes, or large bodies of fresh water.

"As an antidote against this distemper, the sheep are sometimes chafed with dogs, and not allowed to remain long at once without being disturbed, at the season in which danger is apprehended; for whenever a sheep stops, after having been annoyed, he passes water: and as the bladder is generally burst of such sheep as die of the braxy, a part at least of the complaint may be a stoppage in the urinary passage†."

The *Black-water* is a disease to which the best lambs are often subject in the autumn. They mostly die very suddenly. The best preventative in this case is supposed to be that of keeping them in dry stubbles, or where the grass is very dry.

The *Skits* in lambs both white and green are probably best removed by the use of

\* *Suffex Report*, 4to. Edition.

† *Dr. Robertson's Survey of Perthshire*.



a decoction of chalk and hartshorn-shavings with a small proportion of tincture of opium. Sheep are liable to various other complaints, but they have been described in so vague a manner, and the remedies proposed are of so doubtful a nature, that it could be of little utility to mention them.

It is probable that by the use of salt, especially in wet seasons, and on the wetter sorts of land, where sheep-husbandry is practised, much advantage might be gained, in the health of the sheep being better preserved; especially if some sort of dry food was had recourse to at the same time. It is a substance commonly employed in the sheep-management of most other countries, and of which the animals are particularly fond, though the quantity consumed is not great. The practice is to allow the sheep to lick it up from shallow troughs. The heaviness of the duty upon it is, however, a great bar to its being made use of in this way.

*Horses.*—These animals are indispensably necessary, whether they be considered in regard to the saddle or performing the business of the road or the farm. The circumstances which denote a good horse, whatever the nature of the breed or variety may be, are, that the head be suitably small in proportion to the animal; the nostrils expanded; the muzzle fine; the eyes bright and prominent; the ears close, small and erect; the neck proceeding with a gentle curve from between the shoulders, so as to join gracefully to the head; the shoulders well thrown back, imperceptibly sinking into the neck at the points; the arm or fore thigh muscular, tapering so as to meet a fine sinewy, straight, bony leg; the hoof circular and wide at the heel; the chest deep and full at the girth; the loin or fillets broad and straight; the body round, the hips or hooks not wide; the quarters long; the tail set on so as to be nearly in the same right line as the back; the thighs strong and muscular; the legs clean and fine boned; the leg-bones rather flat than round\*. For the uses of husbandry the chief properties to be considered are, however, those of strength, activity, hardiness and true draught.

The breeds of horses have in general been considered as only two;—the blood or race-breed, and the black cart-breed. But whether this division be well founded or not, the varieties are distinguishable from each other with equal ease by the appearances which they present.

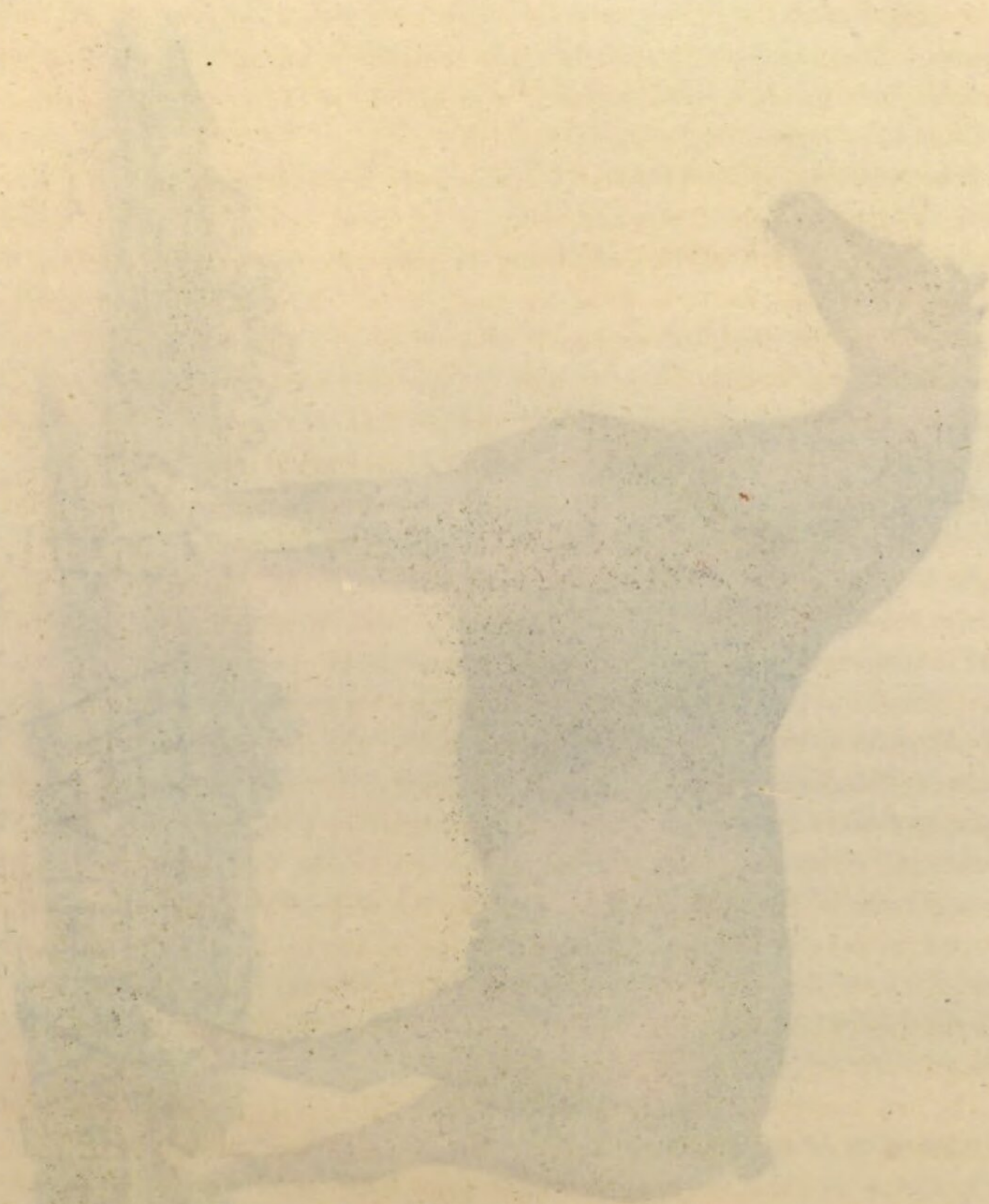
The true bred blood-horse is much too fine for the purposes of husbandry; but when judiciously crossed with the strong sort of cart-horses, improved horses for this use, as well as that of the saddle and light carriages, may be produced. By such means the action, spirit, and pleasantness of horses may be greatly improved.

\* Culley on Live Stock.



Handwritten text, possibly a title or page number, located on the left side of the page.

Handwritten text, possibly a title or page number, located on the left side of the page.







Page 10.

# *The Suffolk Punch Horse.*

Printed for Richard Phillips, 71. St. Pauls Church Yard, Oct. 23. 1804



4 1625.





*The Suffolk Punch Horse*

*Printed by Messrs. W. & A. G. Wallis, 10, Abchurch Lane, London, E.C. 4.*



The *Cleveland-bays* are a breed or variety of horses that have derived much advantage in this way. They are principally distinguished by their colour, which is mostly bay; their form good; their size large; and their activity, strength, and hardiness superior to most other sorts\*. With full blood stallions this variety is said to afford excellent hunters and saddle-horses; and with half-bred stallions excellent carriage-horses and for the plough. They move quick, and are capable of great exertion. This valuable sort of horses is produced in different parts of Yorkshire, Durham, and Northumberland.

The *Suffolk-punches* are another useful sort of horses for the purpose of the farmer. They are distinguished by the colour, which is mostly yellowish or sorrel; by having a white ratch or blaze in the face; by the head being large; ears wide; muzzle coarse; fore end low; back long, but straight; sides flat; shoulders too far forward; hind quarters middling, but rather high about the hips; legs round, and short in the pasterns; deep bellied; full in the flank; not large in size†.

This on the whole, though but an ordinary sort of horse in regard to form, is found highly useful in draught, especially for the plough and cart. These horses are very hardy, and capable of performing more labour than most other sorts. They are most prevalent in the district of High Suffolk.

The *Clydesdale horses* are likewise a kind of horses that answer well for the business of agriculture, especially in hilly districts. They are distinguished by the colour, which is mostly gray or brown; neck longer than in the Suffolk kind; head better formed; eyes more sprightly and animated; body lighter and better formed; legs clean and sinewy; step firm but nimble‡; size larger, from fifteen to sixteen and half hands.

This is a strong, hardy, and active sort of horses, which is said to have been produced by crossing Scotch mares with Flanders stallions. They are remarkably true in the draught. This sort of horses is predominant in the district which bears their name in Scotland.

The *Heavy Black horses* are a sort that may be employed with advantage for some purposes of draught, but are not in general well adapted to the uses of the farmer. This kind is distinguished by the colour, being constantly dark black; by being clumsy in their form, and seldom well-proportioned; slow in their motion; with rough fleshy legs; the size large.

This breed of horses is found to prevail in the Midland districts, as in Leicestershire, Derbyshire, Lincolnshire, &c. where the mares are chiefly employed in farm-labour;

\* Culley on Live Stock.

† Ibid.

‡ Anderson's Recreations in Agriculture, &c.



the horses being disposed of according to their sizes; the largest for dray-horses, the next for draught in waggons or other teams, and the smallest for the purposes of war.

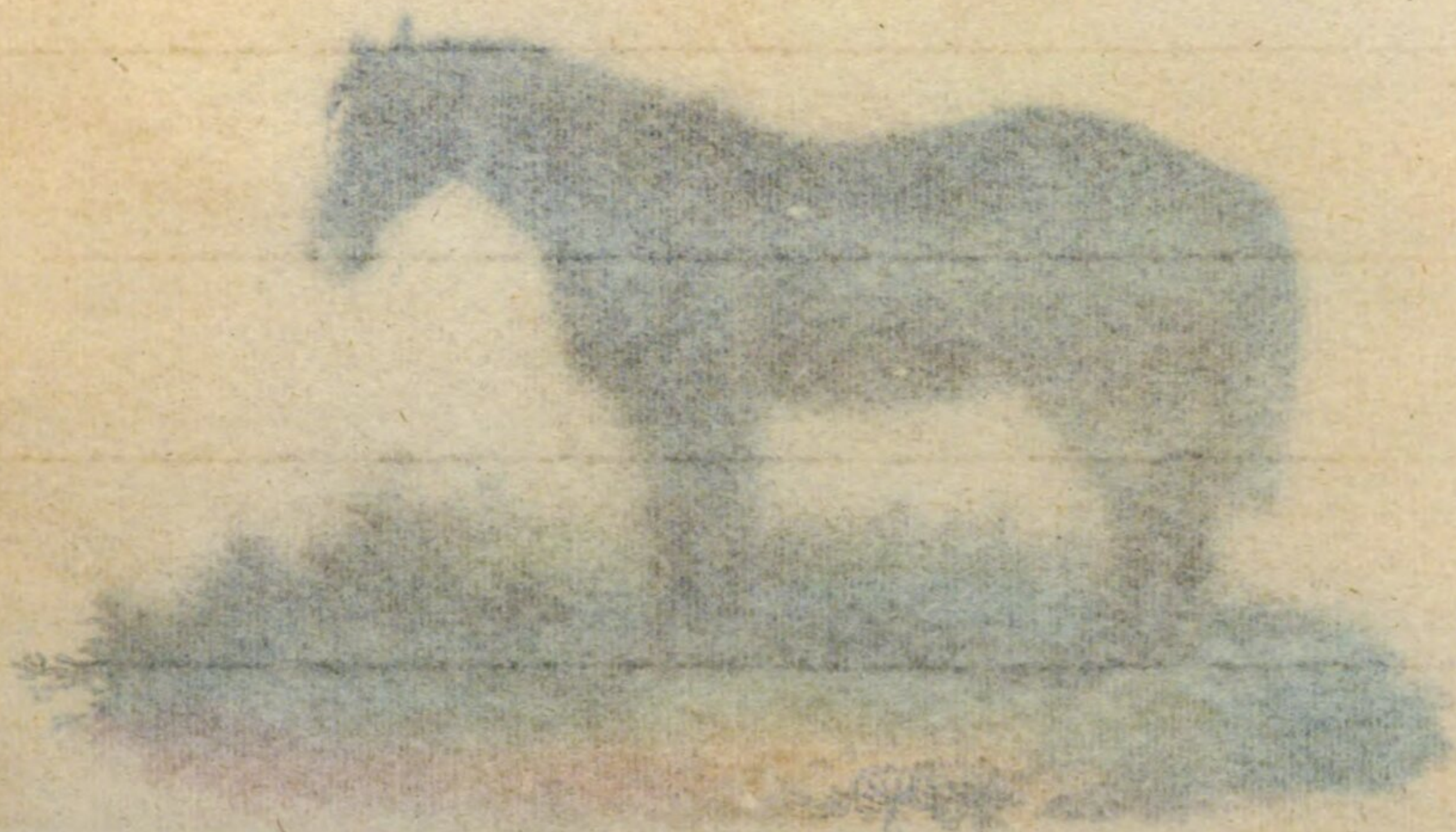
The *Welsh* and *Scotch* horses are in general too small for the purposes of agriculture.

It is evident from the nature of these different sorts, that for the purposes of farm-labour horses must be chiefly selected from the *Clevelands*, the *Suffolks*, and the *Clydesdale* kinds: the first affording such as are adapted to great exertion and dispatch; the improved sort of the *Suffolk* kind being well suited to field-work where much perseverance is required, as they can be constantly employed in this sort of labour without inconvenience. And the last sort, from the great muscular exertion that can be occasionally employed, as well as from their being true in the draught, are particularly suited to hilly situations. In respect to economy in keep and the expense in procuring, the two last sorts are probably to be preferred, as they are both very hardy in their dispositions, and can in general be obtained at easy prices. From the great advantage that has lately been found in employing, even for the purpose of draught, in the more heavy sorts of carriages, such horses as have a little of the race or blood kind in them, the use of the heavy breeds is becoming daily less frequent and necessary.

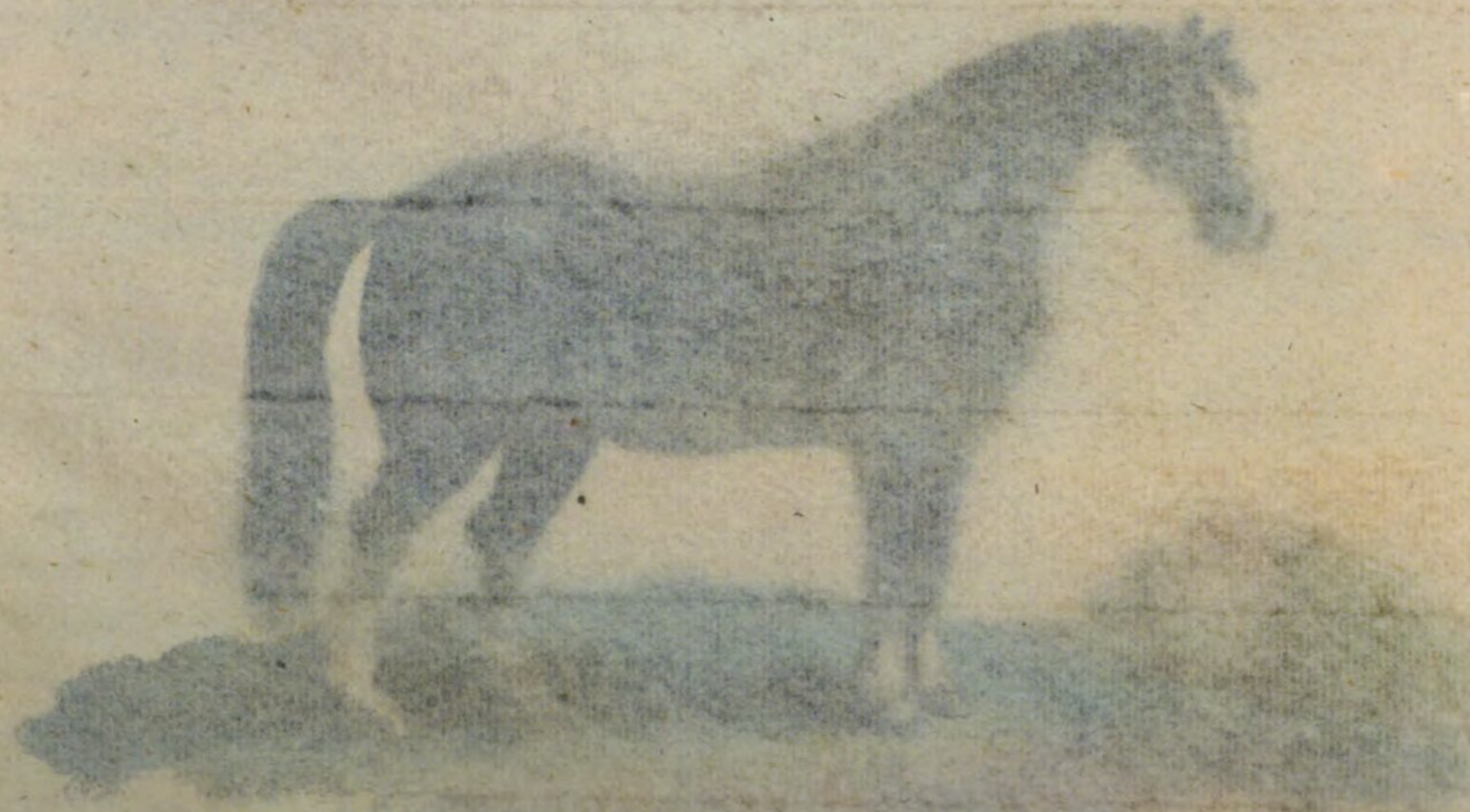
The practice of breeding horses, as it requires a great extent of pasture-ground and capital, from the great number of mares that must be constantly kept, and a deal of nice and attentive management in the servants that are employed, it is only in particular situations and circumstances that it can be attempted with success, as where the proportion of coarse pasture-land, that cannot be converted to the purpose of grazing or fattening animals, on the farm is considerable. This is the case in the fens and marshes of *Lincolnshire*, and some parts of the *North Riding of Yorkshire*\*, as well as other districts: In such situations, however, with proper knowledge and due care in the management, great advantage may often be derived. Wherever this system is undertaken, the same care and judgment must be exercised in selecting such mares and stallions as are the most suitable for the particular purpose which the farmer has in view in breeding them, as have been recommended in the propagation of other sorts of live stock, as without this sort of attention it is impossible that the greatest benefit can be obtained. The too common custom of breeding from any mare that may chance to be in the possession of the farmer should never be adopted. It is

\* Corrected Reports of *Lincolnshire* and the *North Riding of Yorkshire*.





Cart horse.





the largest for dray-horses, the middle for the lighter sorts, and the smallest for the purposes of agriculture.

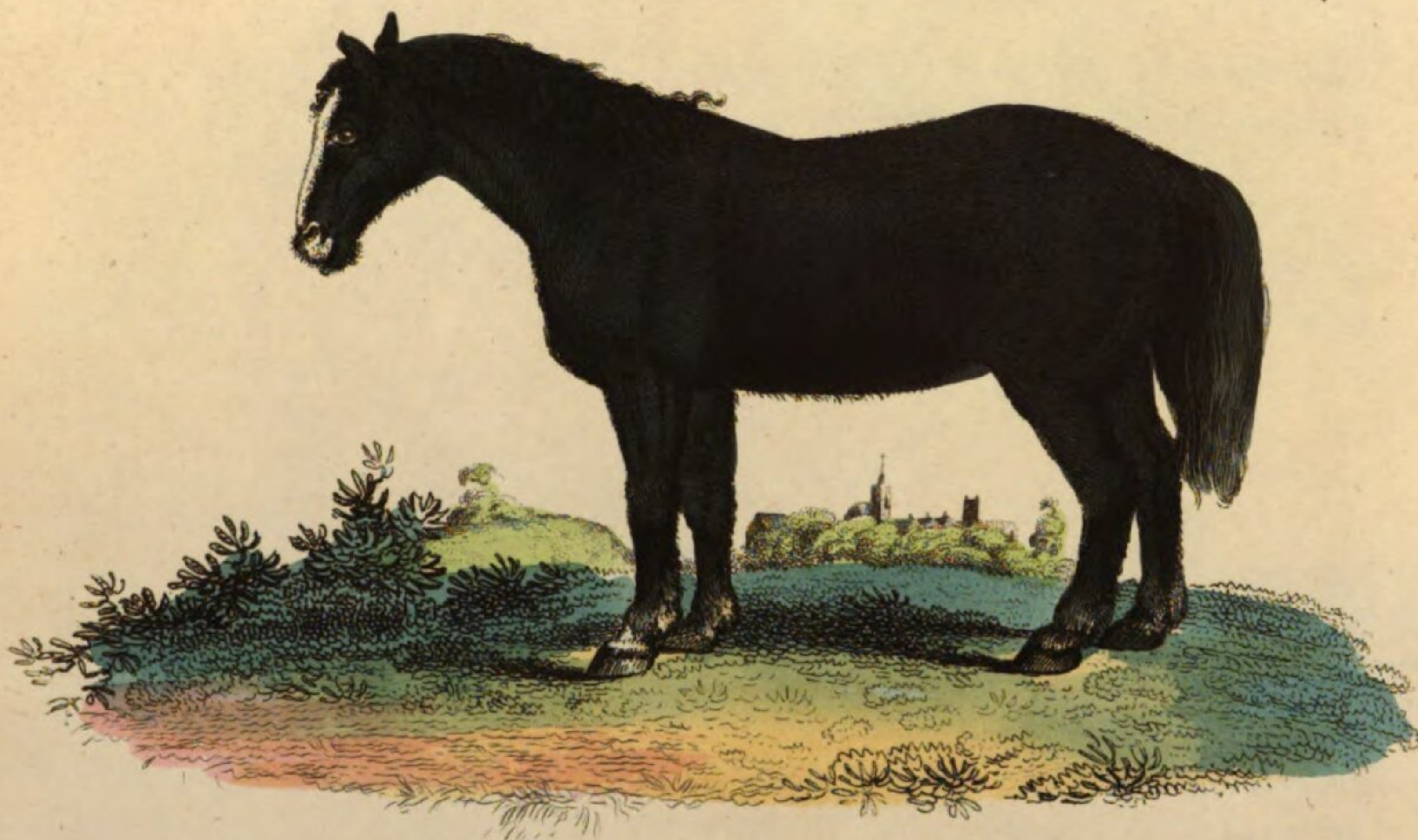
The three sorts of horses are in general so mixed for the purposes of agriculture.

It is not necessary to select of these different sorts, that for the purposes of farming, the best may be selected from the Clevelands, the Suffolks, and the other sorts, but it is necessary to select such as are adapted to great exertion and labour, the Suffolk-kind being well suited to field-work, and the other sorts being well suited to the purposes of the carriage. And the last sort, from the great muscular power, and the great strength of the muscles, as well as from their being true in the way of the carriage, are probably to be preferred, as they are very durable, and can in general be obtained at easy prices. From the great labour that has lately been found in employing, even for the purpose of carrying the more heavy sorts of carriages, such horses as have a little of the race or blood kind in them, the use of the heavy breeds is becoming daily less and necessary.

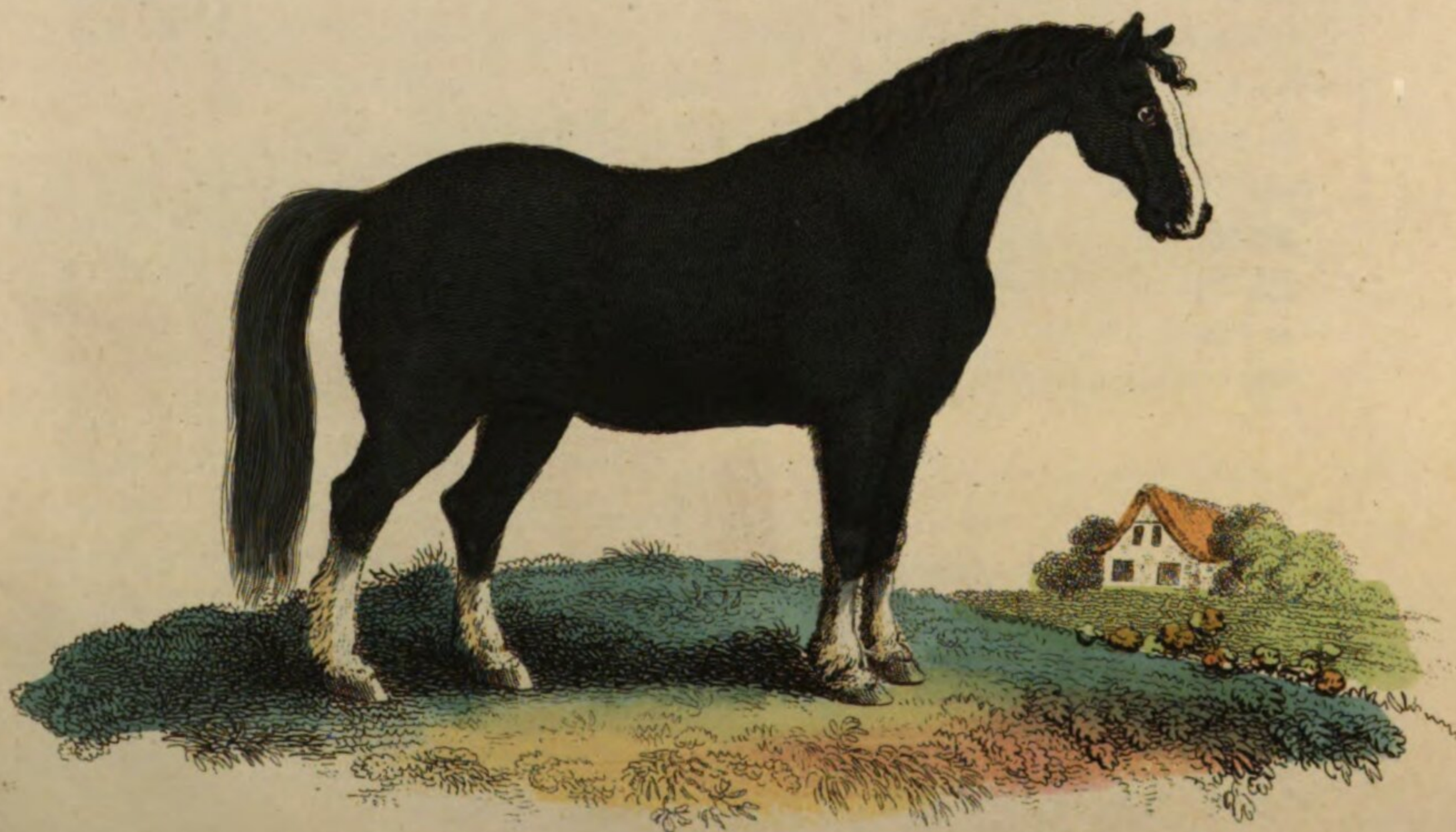
The practice of breeding horses, as it requires a great extent of pasture-ground and capital, from the great number of horses that must be constantly kept, and a deal of nice and attentive management in the servants that are employed, it is only in particular situations and circumstances that it can be attempted with success, as where the proportion of the pasture-land, that cannot be converted to the purpose of grazing or fattening, is considerable. This is the case in the fens and marshes of Lincolnshire, and some parts of the North Riding of Yorkshire, as well as other districts. In such situations, however, with proper knowledge and due care in the management, great advantage may often be derived. Wherever the practice is attempted, the most care and judgment must be exercised in selecting the best and most suitable for the particular purpose which the farmer has in view in breeding them, as have been recommended in the propagation of other sorts of live stock, as without this sort of attention it is impossible that the greatest benefit can be obtained. The too common custom of breeding from any mare that may chance to be in the possession of the farmer should never be adopted. It is

\* Careful Reports of Lincolnshire and the North Riding of Yorkshire.





*Old Cart horse.*



*Improved black Cart horse.*







only by covering well-made and tried mares by stallions that are equally well-formed and known for their good qualities, whatever the breed may be, that valuable horses can be produced.

The season of putting the mare to the horse is the spring, as April or May, as in breeding colts it is of material consequence to have the foals dropped early, often so soon as in February or the preceding month\*. In Yorkshire the most usual period of foaling is about May-day, and that of weaning towards the latter end of September. In the length of time that a mare goes with foal there is frequently considerable variation, but it is mostly about eleven months. This is a circumstance that should be kept in mind by the breeder.

While with foal, it is of importance that the mare be kept pretty well, as in the contrary case the foal is seldom so fine or healthy. It is a practice with some farmers to perform the work of their farms with breeding mares; but this method requires much caution, and is always attended with a degree of danger. Besides, it can scarcely ever be worth the farmer's while to breed where the foals will not defray the expense of keeping the mares without their performing much work, either before or after they have foaled. In some cases, especially with farm-mares, it may, however, be beneficial to work them a little carefully, by way of exercising them, but they should not on any account be hard wrought when with foal or while suckling.

The foals should continue to suck till towards the beginning of October or November, the mares being kept as well as possible, in order that their growth may not be checked from the want of milk while young. When taken from the mares at first, it is a very good method to let them have an open roomy house with a rack and box for their food; and if it communicate with a small field or paddock, into which they can run, it is of great advantage in the rearing of the foals, both in the way of food and exercise, as they should never be too much confined. By being more at liberty they become not only more strong and healthy, but acquire more and a better action, which is essential in the horse.

The dry food should at first consist of the nicest and most sweet hay of whatever sort it may be. Sweet green *rouen*, where it can be provided, might be very useful in this intention. Carrots are likewise found an extremely beneficial sort of food in the rearing of foals. It has indeed been thought scarcely possible to breed horses to any profit without a considerable dependence upon them†. Their laxative property is also

\* *Annals of Agriculture*, Vol. XXXIV.

† *Ibid.*



supposed by some highly beneficial in the raising of foals\*. With these sorts of food it is necessary always to make use of oats and bran or pollard in suitable proportions, as it is only by these means that these young animals can be brought forward in the best manner. When there is sufficient grass in the spring, it is a proper practice to turn the foals out into a convenient dry pasture, where there is rather a short sweet bite, and a good supply of pure water for them to drink at as often as they like. In the second winter less care will be required than in the first; but the same indulgence, in respect to the liberty of their going in and out of the shed at pleasure from the field, should be allowed. In this mode of rearing foals they will become useful at two years old when intended for the work of the farm, and if for sale be in a condition to fetch a good price; which would not be the case if they were kept in an inferior way. But there is another circumstance to be taken into the account, which is, that it is this variation in the keep that constitutes the difference between a good and bad horse; which, as it chiefly consists in the addition of the oats, is no very great affair, at least upon good horses, whether for saddle or work. Upon horses of low value, it will not probably repay the breeder to bestow this sort of keep upon them. It can seldom be advisable for farmers to pursue it in horses that are worth less than from twenty-five to thirty pounds at four years old: where oats are made use of as a part of the food of young horses, care should be taken that they are *really* given to them.

In some parts of Yorkshire the farmers, instead of breeding foals, pursue the system of buying colts in yearly, when two or three years old, which they keep till four or five, using them for the purposes of the farm: they are then sold to the London or other dealers. By this management their stock is kept up, and they make a considerable annual profit, besides having the internal work of the farm performed. They are principally employed in the plough, and in many cases not shod till the period of being sold. When intended for the carriage, this easy sort of work is found of advantage in rendering them more quiet and tractable†. In other districts it is the practice to buy in at three years old, in the autumn, keep them during the winter on straw, work them a little in the spring, and sell them in the latter end of summer at the fairs in the vicinity, by which method good judges make money‡.

The Yorkshire farmers, who mostly raise their foals from their working mares, are often careful not to allow the foals to suck till the udders of the mares coming

\* Experienced Farmer, Vol. II. † Corrected Agricultural Report of the North Riding of Yorkshire.

‡ Corrected Agricultural Report of Lincolnshire.



from work have been well bathed with cold water, and a great part of the milk drawn away.

The propriety of castrating horses has been disputed by some, as being disadvantageous in the loss of vigour that it causes. The practice certainly proceeds on the principle of sacrificing a portion of the strength of the animals to the convenience of managing them. This in many instances is without doubt necessary as well as convenient; but there can be no difficulty, by proper management, in making stallions perform the business of the farm, which, from their superior strength, is supposed by some, on experience, to be executed with great advantage over that of using geldings\*.

Where the operation of gelding is to be performed, the best time is probably when the foal is about three months old, though some prefer a much more advanced age, as six or twelve months, and even more in some cases. In all animals there is, however, the least danger of inflammation while they are young in performing such operations. Besides, it is better to cut colts before they have any propensity to hanker after the mares, and get bad habits†. When the foals are early, and the weather is not too hot, the latter end of May or beginning of June may be a good and proper season.

Some of the Yorkshire breeders, however, think that they find advantage in deferring the operation till the horses are two years old, as they suppose "they become stronger and handsomer for it." And where the operation is done at one year old, they find that the foals have not recovered the check they sustained by weaning before they experience another in this operation. They experience no difference in their recovery at two years old than one. The foals should be kept up some time before the gelding is to be performed.

In performing the operation, the best method is that of cutting open the *scrotum* or cod with a sharp knife for the purpose, dividing the spermatic cords and vessels, taking out the testicles, and then securing them by means of ligatures, closing the wound immediately, the ends of the ligatures being left out at some part, so that they may be drawn away as suppuration advances. This is much better than the old practice of searing with a hot iron, or the more recent one of causing the separation of the *scrotum* and testicles by *twitching* or tying them tight with a small string.

In the breaking of horses there is seldom much trouble if the business be well managed and undertaken sufficiently early. In farm-horses the best method is probably that of haltering the foal as soon as it is taken from the mare, leading it

\* Annals of Agriculture, Vol. XXXVI.

† Experienced Farmer, Vol. II.



from place to place till it becomes perfectly quiet and manageable; then to have it tied in the stall and cleaned in the manner of the other horses, accustoming it to have its feet taken up and cleaned when necessary. These methods should be continued till it becomes perfectly tractable; it may then be put into the middle of the team in proper harness, so as that it may be forced about by the other horses, without having any thing to draw. When it is quite gentle in this situation it may be backed, if that has not been done before. In order to give it a mouth, a small bit should be let hang loose in its mouth till it becomes accustomed to it, and then it may be managed in any way at pleasure, being taught not only to walk, but trot, and even gallop well. In this treatment it soon becomes perfectly tractable and fit for any use on the farm.

In making young horses, as two-year old colts, up for sale in the autumn, the Yorkshire breeders turn them into good grafs, taking them up about a week before the period of selling to reduce the carcase, improve the coat, and teach them to lead. They are mostly disposed of to sale with their full tails. Mashcs of bran, ground oats, and boiled corn are then given them by these persons for two or three months, and various other operations practised upon them in order to render them more saleable\*.

It is a question that has been much agitated, whether horses or oxen are the most economical and advantageous for the purposes of the farmer in performing his work, and which is not yet fully decided. The circumstances in which the latter have been chiefly supposed to be more advantageous than the former, are in their being kept at less expense, and their not declining in value. But these, when examined, are probably not so decisive of their superiority as they may at first sight appear; for where the work of the farm is done by the younger sort of horses, which is perhaps the best method, the decline in value cannot be of any material consequence, while the superiority in point of the dispatch of work is very great. And in regard to the keep, as oxen cannot perform their labour well in continuance without oats or some other sustenance of a similar kind, it would seem not improbable but that young horses may pay nearly as well as oxen, and be kept with little difference in the expense. The principal difference appears to be in the oxen being supported at less expense when not employed. But horse-teams under proper management should never be unemployed.

The common opinion, that oxen are superior to horses in the tillage of heavy

\* Corrected Agricultural Report of the North Riding of Yorkshire.



lands does not appear to be well founded, especially where drawn in yokes, as the poaching must be greater than by horses working at length. But when in harness they may, from their greater steadiness, be preferable. Under different management they are consequently capable of being employed in both ways.

Horses are however greatly superior to oxen, where quick motion is of more importance than the steady drawing of heavy weights; and also in carting, where great speed is required in the unloaded state; and wherever the roads or lands are rough, sharp, and stony, as they cannot be shod so well as horses to stand such roads. In harrowing with light harrows, where a jumping irregular motion is necessary, horses are likewise said to be the most proper\*.

Mr. Young, in his valuable *Calendar of Husbandry*, has however well remarked, that "there are two cases in which oxen are certainly more beneficial than horses: First, when a farmer lives in a district where there is a breed of cattle well adapted to work; and, secondly, when his farm is so large that he can buy in a considerable lot of cattle annually, at a small expense per head, and feel no inconvenience in turning out such beasts from the teams to fattening as do not work well. In both these cases he has little doubt of the superiority of oxen to horses. But in countries that do not possess a breed of cattle well adapted for work in the state of oxen; and on small farms, whence fairs must be attended at the distance of a hundred miles to purchase a few, and consequently at a great expense per head, and possibly without land for fattening any, the benefit will be very questionable. In such a case he should prefer the bulls of the country, which are every where to be procured probably much cheaper than oxen; are broken in with but little difficulty; which work well, and which will recover from fatigue sooner than any ox. This he believes from what he has experienced, and from all the information he has procured, is stating the question of the comparison of horses and oxen as nearly to the truth as it can be done in few words. There are, however, some works in the business of a farm, in which horses are better than either oxen or bulls, and therefore it may be advantageous to keep a few horses†."

The feeding of teams, whether of horses or oxen, is a point that demands much care and attention, as a want of economy in this respect may lessen the profits of the

\* *Annals of Agriculture*, Vol. XXXVI.

† In comparing the expenses in the different sorts of teams, it is remarked in the *Survey of the North Riding of Yorkshire*, that where young horses are employed in the cultivation of farms during their growth, and then sold, the horse-team will be the most profitable. But as this mode can only be limited where



farmer in a very material degree, as is evident from the greatness of the consumption of expensive food. It has been found, that working horses, without being fed too highly, or so as to improve in flesh, have consumed in the proportion of twenty

blemished, aged, or other horses to be worn out are made use of, the ox-team will be most advantageous both to the farmer and the public.

The following statements show the advantages of the different methods :

*Expense of Horse-Team per Annum.*

| DEBTOR.                                      |       |       | CREDITOR.                       |       |       |
|----------------------------------------------|-------|-------|---------------------------------|-------|-------|
|                                              | £.    | s. d. |                                 | £.    | s. d. |
| One three-year old horse . . . . .           | 14    | 0 0   | By labour 200 days in the year, |       |       |
| One four-year old horse . . . . .            | 18    | 0 0   | supposing them to plough one    |       |       |
| Hay, or grafs, for two horses, at 4s. per    |       |       | acre one rood per day, which,   |       |       |
| week each, for fifty-two weeks . . . . .     | 20    | 16 0  | at 5s. per acre, is 6s. 3d. per |       |       |
| Corn for ditto, 200 days, at one peck        |       |       | day, but deducting 2s. per day  |       |       |
| and a half each day—nine quarters            |       |       | for the man's wages—their       |       |       |
| three bushels, at 18s. per quarter . . . . . | 8     | 8 9   | labour will be 4s. 3d. per day  | 42    | 10 0  |
| One year's interest of the first cost of the |       |       | The improved value of the four- |       |       |
| horses . . . . .                             | 1     | 12 0  | year old horse . . . . .        | 18    | 0 0   |
| Shoeing . . . . .                            | 1     | 5 0   | A five-year old horse, sold for | 22    | 0 0   |
| Profit . . . . .                             | 18    | 8 3   |                                 |       |       |
|                                              |       |       |                                 | £. 82 | 10 0  |
|                                              | £. 82 | 10 0  |                                 |       |       |

*Expense of Ox-Team per Annum.*

| DEBTOR.                                          |       |       | CREDITOR.                       |       |       |
|--------------------------------------------------|-------|-------|---------------------------------|-------|-------|
|                                                  | £.    | s. d. |                                 | £.    | s. d. |
| A pair of four-year old oxen . . . . .           | 22    | 0 0   | By labour 200 days, supposing   |       |       |
| Hay, or grafs, for ditto, fifty-two weeks,       |       |       | them to plough one acre per     |       |       |
| at 3s. each . . . . .                            | 15    | 12 0  | day, which, at 5s. per acre, is |       |       |
| Interest of the first cost of the oxen . . . . . | 1     | 2 0   | 5s. per day, but deducting 2s.  |       |       |
| Profit . . . . .                                 | 16    | 6 0   | per day for the man's wages—    |       |       |
|                                                  |       |       | their labour will be 3s. per    |       |       |
|                                                  | £. 55 | 0 0   | day . . . . .                   | 30    | 0 0   |
|                                                  |       |       | Suppose the oxen are worked two |       |       |
|                                                  |       |       | years, the value of them at six |       |       |
|                                                  |       |       | years old would be about 28l.,  |       |       |
|                                                  |       |       | which makes the improved        |       |       |
|                                                  |       |       | value in one year . . . . .     | 25    | 0 0   |
|                                                  |       |       |                                 | £. 55 | 0 0   |



pounds of good hay each in the course of the day, with a weekly allowance of two bushels of oats each and chaff. With a smaller allowance, which is often made by farmers, they cannot be kept constantly at work without falling off in condition,

*Expense of Horse-Team per Annum.*

| DEBTOR.                                                                     | £.    | s. | d. | CREDITOR.                     | £.    | s. | d. |
|-----------------------------------------------------------------------------|-------|----|----|-------------------------------|-------|----|----|
| By wear and tear of two horses, value 30l. supposing them to last ten years | 3     | 0  | 0  | By value of their labour      | 41    | 10 | 0  |
| To interest of prime cost                                                   | 1     | 10 | 0  | By value of their skins, 22s. | 1     | 2  | 0  |
| Hay and grafs                                                               | 29    | 16 | 0  |                               |       |    |    |
| Corn                                                                        | 8     | 8  | 9  |                               | £. 42 | 12 | 0  |
| Shoeing and farriering                                                      | 1     | 5  | 0  |                               |       |    |    |
| Profit                                                                      | 7     | 12 | 3  |                               |       |    |    |
|                                                                             | £. 42 | 12 | 0  |                               |       |    |    |

*Expense of Ox-Team per Annum.*

| DEBTOR.                                                            | £.    | s. | d. | CREDITOR.                                          | £.    | s. | d. |
|--------------------------------------------------------------------|-------|----|----|----------------------------------------------------|-------|----|----|
| Interest of prime cost of a pair of four-year old oxen, value 22l. | 1     | 2  | 0  | By value of their labour                           | 30    | 0  | 0  |
| Hay, or grafs, for ditto                                           | 15    | 12 | 0  | Supposing them worked six years, the value of them |       |    |    |
| Risk and accidents                                                 | 0     | 10 | 0  | would be then 28l. bearing                         |       |    |    |
| Profit                                                             | 13    | 16 | 0  | an annual profit of                                | 1     | 0  | 0  |
|                                                                    | £. 31 | 0  | 0  |                                                    | £. 31 | 0  | 0  |

The profit of two oxen working one year, is

13 16 0

Ditto, of two horses

7 12 3

6 3 9

But as you must keep one-fourth more oxen to do the work of two horses, the profit of working your farm with oxen would be one-fourth more

3 9 0

If, therefore, the labour which required two horses to perform it, were performed with oxen, the profit of the oxen would be greater than the profit of the horses, by

£. 9 12 9



by which there must ultimately be a loss to the farmer. The above allowance is necessary for about twenty weeks during the winter\*.

To lessen the heavy expense of keeping farm-horses, it has been suggested that there are only two methods; one of which is, not to turn them out in the summer, but to have them soiled constantly in the stables or yards with lucern, tares, and clover; as in this way, where littering is properly attended to, the manure that is produced will nearly balance the expense of the keep, besides avoiding various inconveniencies attending the pasturing of horses in the fields. The other mode is that of substituting carrots in the place of oats, as a winter food; a practice common in the county of Suffolk, and attended with much success†. Estimating the prime cost of carrots to the farmer at three pence the bushel, and that of the oats at ten shillings the quarter‡, and allowing the customary quantity of one bushel of carrots a day against the two bushels of oats in the week, the horse at carrots consumes in the proportion of 1s. 9d. a week; while that at oats is 2s. 6d. Besides, the superiority of this proportion of carrots to that of the oats, in the support of the horse, is very considerable; probably five bushels of carrots per week would be equal to it, as in this district they consider a bushel a day feeding highly§.

But, besides this excellent root, there are others that may be made use of in feeding horses in order to save oats: boiled potatoes with a little chaff and a few carrots have been attended with perfect success in the trials of Mr. Guthrie in Scotland, keeping the horses in fine order without any oats||. And in England they have been applied in the same way with similar success.

There is another point to be regarded in the feeding of horses, in order to its being done in the most economical manner, which is that of having as much of their

"Thus, four horses working upon a farm, do not appear to leave as much profit, by this last mode of cultivating it, as five oxen would, by the sum of 19l. 5s. 6d.; while the former mode of cultivating it by horses would leave a profit of four guineas in favour of the horses: the balance, therefore, on the whole, is in favour of the oxen, by the sum of 15l. 1s. 6d."

\* The keep in a team of four horses may be estimated in this way, according to the present prices of the different articles of food:

|                                                   | £.  | s. | d. |
|---------------------------------------------------|-----|----|----|
| Winter-food — To 7 tons of hay at 4l. per ton,    | 28  | 0  | 0  |
| To 26 quarters of oats at 28s. per quarter,       | 36  | 8  | 0  |
| Summer-food — To graze 26 weeks at 20s. per week, | 26  | 0  | 0  |
| To 13 quarters of oats                            | 18  | 0  | 0  |
|                                                   | 108 | 12 | 0  |
| Or per horse without chaff 27l. 2s.               |     |    |    |

† Annals of Agriculture, Vol. XXXVI.

‡ These prices are much too low for the present, but they serve to show the difference in the expense.

§ Annals of Agriculture, Vol. XXXVI.

|| Ibid.



dry fodder as possible, such as hay and straw of different kinds, cut into chaff, before it is given to them with their other food. And it is probable that by having the oats broken or bruised, not ground, as has been often recommended, some saving in that expensive article may be made\*, though it has been contended by some that horses do not thrive so well when the oats are prepared by grinding. It is probable that, when reduced into too fine a state, they may not be so well digested, from their being swallowed more greedily, and without the *saliva* of the animal being so intimately blended and combined with the substance of them, as when left so as that some degree of chewing becomes necessary. But even when given in the whole state, some horses swallow much of them without due mastication, as is obvious from their being voided in a perfect state, and so little changed as to be capable of supporting poultry and other granivorous birds. Consequently something in this matter depends upon the habits of eating in the horses.

By the use of barley instead of oats, perhaps some degree of saving might be made, as that sort of grain would go farther than oats in the same proportion. It has been objected to in this intention by some, from its supposed heating quality: but from its having a more laxative or opening property than oats, it would seem to have the contrary effect; and as a proof of which, it is found to be the ordinary food for horses in most hot countries†. It may probably be more unfavourable from its aperient property in many cases, in the feeding of horses, than that of its supposed heating tendency. Experience has however shown that it is a hearty and nutritious food when applied in this way‡.

In situations where the *furze* or *whin* plant§ can be grown with facility, a degree of saving in the hay as well as corn may be effected by the use of it, cut green while young and bruised in mills for the purpose. It has been found from some experiments that an acre will afford fifteen tons of this sort of food, and by others as much as will feed six horses for six months||.

In the feeding of ox-teams, equal care and attention is necessary to see that while they are perfectly well supported, no waste of food is made; which is often the case with incautious feeders. When at hard work in the autumn and beginning of the spring seasons, they should have a good supply of hay, straw, and cut-chaff, with a daily allowance of some sort of roots, such as turnips or carrots, or a sufficient proportion of cabbages, as from forty to fifty pounds weight where the oxen are large. But during the summer they may be stabled in the stalls or yards in the manner of horses, a full supply of litter being provided, and water for them to drink when

\* Lord Dundonald on the Connexion of Chemistry with Agriculture.

† Annals of Agriculture, Vol. XXXVI.

‡ Lord Dundonald.

§ *Ulex Europæus*.

|| Annals of Agriculture, Vol. XXXVI.



wanted. When at plough in the beginning of the autumn, it will be necessary to give them oats and cut chaff in such proportions as may be requisite, as the grass at that period begins to be less nutritious.

In the working of teams, whether of the horse or ox kind, one circumstance is to be constantly kept in view; which is, that, as their keep is so very expensive, they be always employed; as it is obvious that if they stand idle half or a third of their time, the labour that is performed must cost the farmer double, or a third more than in cases where they are constantly at work, and of course much loss be sustained. On arable farms this is particularly necessary to be attended to; and of course in the autumn and winter, when the business of the plough is at a stand, other sorts of team-work, such as carting, in the former, on light dry soils, chalk, marl, and clay, and on the wetter grass lands, manure, in small carts; and in the latter, in frosts, manures of the compost or other kinds, removing various sorts of earthy materials from borders and other places, for mixing with or forming the bottoms of dungsteads; and when the weather is open, in taking the corn, and bringing manure, or any other business that is to be done; as it must always pay the farmer to have it accomplished in such circumstances as that the team must otherwise remain unemployed. The keeping of teams upon poor food, such as straw, during the winter, in order that they may not be in work, is always bad management, as their labour in the rest of the year must stand the farmer very high.

In the feed-time the farmer should be careful that they perform a proper day's work. It has been observed by Mr. Young, that in this season the farmer "should not let them work less than nine or ten hours; but this he will not be able to effect, if the ploughmen have to take care of their horses. It is the best to have horse-keepers, for the mere attendance of the teams, so that the men who hold the ploughs may have nothing to do but the mere ploughing. Let the horse-keeper have the horses fed and harnessed ready for the ploughman, to be in the field by six o'clock. At eleven they should come home for an hour and a half to dine and bait, during which time the horse-keeper is in attendance again. At half an hour after twelve, they should go out again, and work till half an hour after five, when the horse-keeper should again take the teams. By this method a pair of horses in a well-made plough will, without any driver, plough an acre and a quarter, or half, very easily; and no object is more important, than the plough's doing a good day's work in the spring of the year. The consequence, especially of making the most of dry weather in March, is extremely great. One acre ploughed and sowed then may be fairly worth two that are left till the beginning of May."

When the fields are at a distance, it may however be more advisable to have the



teams baited in them than to come home for the purpose, especially in the autumn and winter seasons when the days are short.

Where the above management is adopted, a great deal more work will be done, than when the *carter* or *head man* has the care of cleaning and managing the horses, as, in order to give himself more time, he takes every means of shortening the day's work. An odd man, who can be occasionally employed on other jobs, and fully depended upon, may be proper to be made use of as horse-keeper; the farmer being attentive to see that the horses be well cleaned in the more concealed as well as other parts\*.

Mr. Bannister remarks, that "the management of the plough team varies essentially in different counties, and even in different parts of the same county, whether the labour to be performed as a day's work by the same number of cattle, the quality and quantity of their food, or the stated hours for baiting and attendance, be considered. In the eastern part of the county of Kent, the waggoner or head ploughman pays an early regard to his horses, and baits them continually with chaff and corn from the time of his rising, at four o'clock till six or seven, when the day's work commences; and in the afternoon, whilst the mate is baiting, the waggoner employs himself by cutting *caving* into chaff, or, where this is not in sufficient plenty, hay and straw mixed, and sometimes oats in the sheaf. At eight in the evening he goes to bed, and leaves the attendance on the team to his mate, who sits with them till ten, so that the horses are left but a few hours to themselves; and this diligent attendance is unavoidably necessary, since in this part of the county the horses are not permitted to have any rack-meat, but have generally a full allowance of corn; whereas, on the other side of the county, the stable-door is rarely opened of a morning before five or six o'clock in the winter, and by nine in the evening the horses are racked up and left to their repose; and as by this method of giving the horses rack-meat the less chaff is required, so there is generally a sufficient quantity of this produced by the thrasher; if not, the labour of cutting does not often fall to the ploughman, but is paid for by the farmer to a person who is expert at this business."

By the former practice there is, it is observed, a reserve of a considerable quantity of fodder, which, when given to the horses without limitation, forms a large item in the rural account at the end of the year, especially when the situation is within a small distance of London, or any place of considerable note, where hay usually fetches a large price; to which may be added the advantage which the horses reap from the constant attendance that must necessarily be paid to them when baited in that manner: besides, the servants are kept continually in their work, and prevented from loitering away the afternoons at the ale-house or the smith's shop, as is too frequently the

\* Annals of Agriculture, Vol. XXXV.



case with those who have more leisure on their hands; a great expense is likewise saved, which must otherwise be paid, for cutting chaff. On the contrary, where the more general custom of allowing rack-meat to the horses is practised, the following advantages may be derived: the weekly allowance of corn may be more sparing, and the rack-meat need not be wholly confined to hay, but consist partly of pea- or bean-straw, at those times when the labour of the horses is light; and in seed-time, or whenever the team is tasked with heavy work, though saintfoin, clover, &c. may be allowed them of a night, yet this need not be given in such large proportions, which would quickly consume a large quantity, but be trussed out in such proportion as may be thought expedient, obliging the servants to tend the horses with chaff in the afternoon. Under these restrictions, the consumption of fodder may, perhaps, not exceed in value the sheaf corn allowed to the teams in the former management.

Another circumstance in favour of this practice is its leaving the ploughman at leisure in the afternoon to be employed about occasional jobs, while in the contrary mode the servants have a just excuse for refusing to help in any other work than what appertains solely to the management of their horses.

There is also a third consideration which may ultimately turn out of more consequence than either of the former, and that is the opportunity enjoyed by the farmer who gives his horses rack-meat, of seeing the stable-door locked up at night and opened again in the morning; which cannot be so conveniently done where the ploughman is to sit up late and to rise the next morning at three or four o'clock; and thus an object of the most serious import is left to the care of persons who are rarely deserving of any trust; namely, the danger from fire, as well as the great waste of candles.

Some advise the keeping of team-horses in stables, with short stalls for each horse, so that he may eat his feed separately, and be harnessed with more ease, the partitions not being carried to the ceiling, in order to admit of a more free circulation of air; while others contend for open sheds with racks and mangers fixed below, having a pump and cistern, and a small yard for them to go into at pleasure, as in this method they are found to do better without dressing, than in stables with the ordinary management bestowed by farm-servants\*. In the practice of the Earl of Darlington it was found to answer well. In Suffolk it is likewise the practice with many to turn them into the farm-yard in the nights. The open shed method with yards does well for feeding on hay and carrots in winter, and soiling on green food in the summer, but they should be kept constantly well littered down.

It is probable however, as horses seldom do very well when much exposed to cold,

\* *Annals of Agriculture*, Vol. XXXVI.



that the stable system may have its advantages in the more northern districts; while the open shed mode may be preferable in the southern parts of the island, where the winter season is more mild and favourable.

Corn-chests and chaff-bins should likewise be provided, and it is of consequence to have them conveniently placed for the purpose of feeding the teams. The former should be of sufficient dimensions for containing the weekly allowance of corn for the team, and be placed on blocks of wood on the ground, being furnished with a proper measure and sieve to mix the feed in, with the cut chaff. Each carter should have one, and be provided with a lock and key to it; the chaff-bin must be placed in the centre of the stable when small, and in large ones two may be necessary: they should be made from about five to seven feet square each\*.

The expenses attending teams are liable to vary so very much, according to the horses, the manner of feeding, and other circumstances, that it is difficult to state it with any degree of accuracy; but that which is given below is probably pretty near the truth, as the amount of oats for well-fed horses is mostly found to be about ten quarters, and that of hay a ton and three quarters. Shoeing about sixteen shillings. The rest of the items being liable to much variation†.

There is another point in respect to teams which it is extremely difficult to ascertain, though it is of great importance to the farmer, which is the proportion of horses or other animals that are requisite to the extent of land. It is plain that the nature and situation of the farm, and the method of husbandry that is practised, must have great influence in regulating the number of horses or oxen that will be necessary in its cultivation. It has been observed that one team, on a gravelly, sandy, or other light description of soil, will be capable of performing more labour, or of cultivating a greater proportion of land in a given time, than two on soils of the clayey kind, where the various operations are greatly retarded by their stiffness and adhesion. And that where the

\* *Annals of Agriculture*, Vol. XXXV.

|                                              | £.    | s. | d. |
|----------------------------------------------|-------|----|----|
| † To 10 quarters of oats at 28s. per quarter | 14    | 0  | 0  |
| To 35 cwt. of hay, at 4l. per ton            | 7     | 0  | 0  |
| To shoeing                                   | 0     | 16 | 0  |
| To chaff                                     | 0     | 15 | 0  |
| To farriering                                | 0     | 5  | 0  |
| To decrease in value                         | 2     | 0  | 0  |
| To 26 weeks summer graze at 5s. per week     | 6     | 10 | 0  |
|                                              | <hr/> |    |    |
|                                              | 31    | 6  | 0  |
|                                              | <hr/> |    |    |



situation of the farm is hilly and uneven, a greater strength and extent of team will be requisite than in the contrary circumstances, in order to answer the purposes of tillage. Where, from the nature or locality of the farm, much road-work is to be performed to a distance, a more powerful and fuller team will be wanted than in other cases. The proportion of the grass or feeding land to that of the tillage is likewise to be considered, in determining the number of labouring cattle for the farm, as, where the extent of the former is considerable, there will be less work to be performed, and of course one team may be sufficient where two would otherwise have been required\*.

On hay- and dairy-farms the teams are generally small, as they require little more than the conveying their different products to the markets, and the carting of manure or such other materials as may be necessary in the management of the farms: but as the culture of different sorts of green crops is necessary to the perfect and most economical management of the latter, a somewhat larger team will, in general, be required. In most cases, from three to four horses will be sufficient on such farms, for from one to two hundred acres or even more.

But on perfectly arable farms, especially where the old fallow method of husbandry is practised on one-third or fourth part annually, or on such as are cultivated under the convertible system, a much greater extent of team will be required. In the latter case, however, and in the former also where the improved method of substituting green crops for fallows is pursued, considerable reduction in the number of animals that constitute the teams may be made. In the eastern districts, it has been common to employ four horses on farms that contain only forty acres of tillage-land with a suitable proportion of grass. And with seventy or eighty acres under the plough, and thirty or more in the state of grass, six horses have often been employed. And in these cases seldom more than two horses made use of as a team. In districts where not less than three or four constitute a team, the proportion is still higher. But under good management in the improved methods of cultivation a much less extent of team may be sufficient. The business of forty acres in tillage, with thirty or more in sward and a few in wood, has been accomplished without difficulty by a pair of good horses. And two oxen with one horse would in many cases be adequate to the same extent of land. With two horses and four oxen, the labour of an arable farm of from one to two hundred acres or more may be managed without inconvenience. Some advise the use of ass- and mule-teams in small concerns, as

\* Synopsis of Husbandry.



highly economical; the former being hardy and easily kept, and the latter capable of being worked to a great age. The small mules are the most hardy and useful\*.

The diseases of horses are so numerous that they cannot be fully considered in a work of this nature; but it may be useful to the farmer to know a few of the most appropriate remedies in those that are the most common and most frequently occurring in his teams. These are *wounds, bruises, sprains, warbles, colds, colics, staggers, strangles, jaundice or yellows, worms, botts, glanders, farcy, grease, mange, &c.*

In common recent wounds, the best method of treatment is to bring the sides of the divided parts immediately into contact, where it can be done, keeping them in that situation by slips of adhesive plaister, as by this means they may be the most expeditiously healed. Where there is much laceration of the parts, after such of them as can be brought into union have been washed and cleaned by a soft sponge, and placed in their proper situations, and confined in the manner directed; if on the first removal of the dressings, which should not be for some days, any part remain unhealed, it should be dressed with lint moistened by the tincture of myrrh, adhesive plaister being laid over it. When in the process of healing the granulations of new flesh rise above the surface, they must be kept down by the use of blue vitriol once or oftener in the day and proper compresses, the other dressings being wholly discontinued.

If the destruction of parts be considerable; in order to promote suppuration, the application of warm saturnine fomentations or poultices may be useful. And inflammation should be guarded against by bleeding, and the use of nitrous washes, &c. Where circular bandages can be applied, they will be found useful.

Wounds from punctures, as of nails, thorns, &c. may be dressed by lint dipped in the tincture of myrrh, and secured by adhesive plaister; the hair being first clipped away; and the surrounding parts should be well bathed with a camphorated embrocation.

Greasy applications of all kinds should be cautiously avoided in these cases.

In bruises, where the skin remains unbroken, the use of discutient saturnine camphorated washes is in general the most advisable.

Strains take place in different parts; in the *shoulder* they may often be removed by the application of camphorated preparations, as an embrocation composed of a pint of camphorated liniment, half a pint of opodilloc and four ounces of Barbadoes tar well mixed together, and made use of two or three times a day, after bleeding from the plate vein.

\* Annals of Agriculture, Vol. XXXVI:



When in the *knee*, *back-sinew*, or *fetlock*, much advantage has been found from the application of a cold saturnine poultice to the part, and from a flannel roller passed round the leg, and kept constantly wet with a wash composed of two ounces of crude sal ammoniac dissolved in a pint of vinegar, with two quarts of pure water, and two ounces of vinegar of lead.

Warble tumours arising upon the backs or sides of horses, may be removed with facility by the use of salt and water, brandy, warm vinegar, or a wash composed of opodilloc and spirits of turpentine in equal parts. Where the skin has been rubbed off, the compound tincture of myrrh may be useful. As tumours and bruises of this sort often arise from the saddle's not fitting perfectly, by which extraneous substances are insinuated, great care should be taken in this respect.

Colds, and complaints of that sort, may be best removed, when mild, by rest, and the use of mashes of bran two or three times a day; and, when more violent, by bleeding, and the giving of balls composed of calomel and antimonial powder, each one drachm, powdered nitre one ounce, and treacle sufficient for making them into a ball, which should be washed down with two or three pints of warm oatmeal gruel; the bowels being emptied by means of clysters. In giving these, it is necessary to have a large pipe, as much depends upon it. A powder formed of half a drachm of camphor, one scruple of antimonial powder, with one ounce each of nitre and aniseed, has likewise been found useful.

In colics, when of the spasmodic kind, advantage may often be derived from the use of balls composed of one ounce and a half of Venice turpentine and one drachm of purified opium, with two drachms of powdered ginger, the bowels being occasionally cleared by the use of clysters of gruel in the proportion of three or four quarts. Warm gruel, with bruised caraway seeds boiled in it, may also be occasionally given with benefit.

The staggers is a disease that is frequently much relieved by bleeding; after which, benefit may be produced by the giving of a ball formed of two drachms of calomel, with an ounce of aloes, and two drachms of powdered ginger, made up with honey. Strong clysters may also be had recourse to with benefit, and mashes of bran, oatmeal, or malt, be frequently made use of.

In the strangles, after taking away blood in proportion to the state of inflammation, advantage may be derived from the use of a powder constituted of one ounce of powdered nitre, a drachm of camphor, with half an ounce of powdered aniseed, given twice a day in a quart of gruel. The horse should be warmly clothed about the head, and mashes of bran and oatmeal be frequently given. Saturnine fo-



mentations may be applied frequently warm, by means of flannels, to the tumefied glands; or a bran poultice may be equally effectual;---and much relief may be afforded to the cough, and soreness of the throat, by having the horse to breathe through a nose-bag of scalded bran occasionally for a short time\*.

The yellows is a disorder very common in young horses, without being attended with fever: in these cases much relief is often afforded by a bolus composed of one ounce of powdered aloes, a drachm of calomel, and half an ounce of Venetian soap, given every second or third night. And a ball formed of half an ounce of nitre, with an equal quantity of powdered resin and common soap, may be employed with advantage in the intervening mornings. Mashes and warm water should be plentifully given, and the horse kept warm by clothing, as well as fully exercised †.

Where worms prevail in horses, whatever the kind may be, great benefit may be produced by a powder composed of a drachm of calomel with half an ounce of powdered aniseed, given in the evening in a little treacle; and in the following morning a bolus formed of an ounce of aloes in powder, with two drachms of powdered ginger and a little treacle; or a powder formed of half an ounce of æthiops mineral, with an equal quantity of crude antimony and aniseed in powder. With these remedies there is little danger of the horse being injured by cold, or occasion for any alteration in his food.

In the botts, which are probably produced from the ova of a fly deposited on the skin of the animal during the hot season, and thence licked in by the tongue, and taken into the stomach, where they are afterwards hatched, and adhere to the inner coat ‡, the same method of treatment will be found useful as in the preceding case.

When horses are discovered to be affected with the glanders, they should be separated from the others and confined by themselves, and care taken that they have no sort of communication with the others by any means whatever, as the least thing possible will communicate the infection: the same remedies should then be made use of as in colds and strangles.

In the farcy, when the lymphatic swellings first present themselves about the legs, a blistering liniment well rubbed on the parts, as far as the disease extends, may often be found effectual in removing the disease. Bleeding to the extent of three or four pints may likewise be sometimes had recourse to in the early state of the disorder with success. In the more inveterate state of the complaint, advantage has been found from the use of balls composed of one scruple of muriated quicksilver,

\* Denny's Treatise on the Diseases of Horses.

† Ibid.

‡ Ibid.



with half a drachm of camphor, and the same quantity of purified opium, to which may be added half an ounce of crude antimony in powder, and two drachms of ginger in powder, with honey in proportion to make them up into a ball. And another form that is often beneficial, is that of ten grains of calcined mercury, with half a drachm of camphor and opium, and half an ounce of aniseed in powder, made up into a ball with treacle. Either of these balls may be given every other evening, with mashes two or three times in the day, to which occasionally a handful of malt may be added. The water in these cases should be given warm. Rowels may likewise be put in the chest and thighs when necessary. Cordials and a generous diet should be had recourse to, and warm clothing with gentle exercise daily employed. When the disorder is removed, a ball composed of half an ounce of crude antimony, and the same quantity of sulphur and cremor tartar, with half a drachm of oil of aniseed, may be found very beneficial in restoring the animal.

The grease is a disorder that occurs frequently, and which is best removed by early attention. In well-fed horses bleeding may be useful to two or three quarts, either from the neck, or the thigh, when local bleeding is preferred. The hair should be closely cut from the affected part, which must be well washed with a strong solution of soap and water, after which a saturnine poultice may be applied warm twice in the day; and when the inflammation disappears, half an ounce of powdered alum may be added to each poultice, which should be continued for six or eight days. Warm mashes, with an ounce of nitre dissolved in each, should be given night and morning; and a ball, composed of half an ounce of nitre in powder, with an equal quantity of yellow resin and soap, common turpentine being employed to make them up, may be given once a week. Horses in this situation should have gentle exercise, with a generous diet, and plenty of stable room and clean litter. When the tumefaction subsides, pressure by woollen bandages may be found useful. In Lincolnshire Mr. Cartwright found that common groundsel given to the horses in the stable cured greasy heels\*.

In the mange, after having the parts well washed with soft soap dissolved in water, they may be anointed with an ointment composed of four ounces of sulphur and two ounces of strong mercurial ointment, with three ounces of hogs-lard, every other day; and a ball formed of half an ounce of æthiops mineral, and an equal quantity of crude antimony and cream of tartar, given every night for some length of time†. Great attention is necessary to diet, exercise, and good grooming. Mashes with

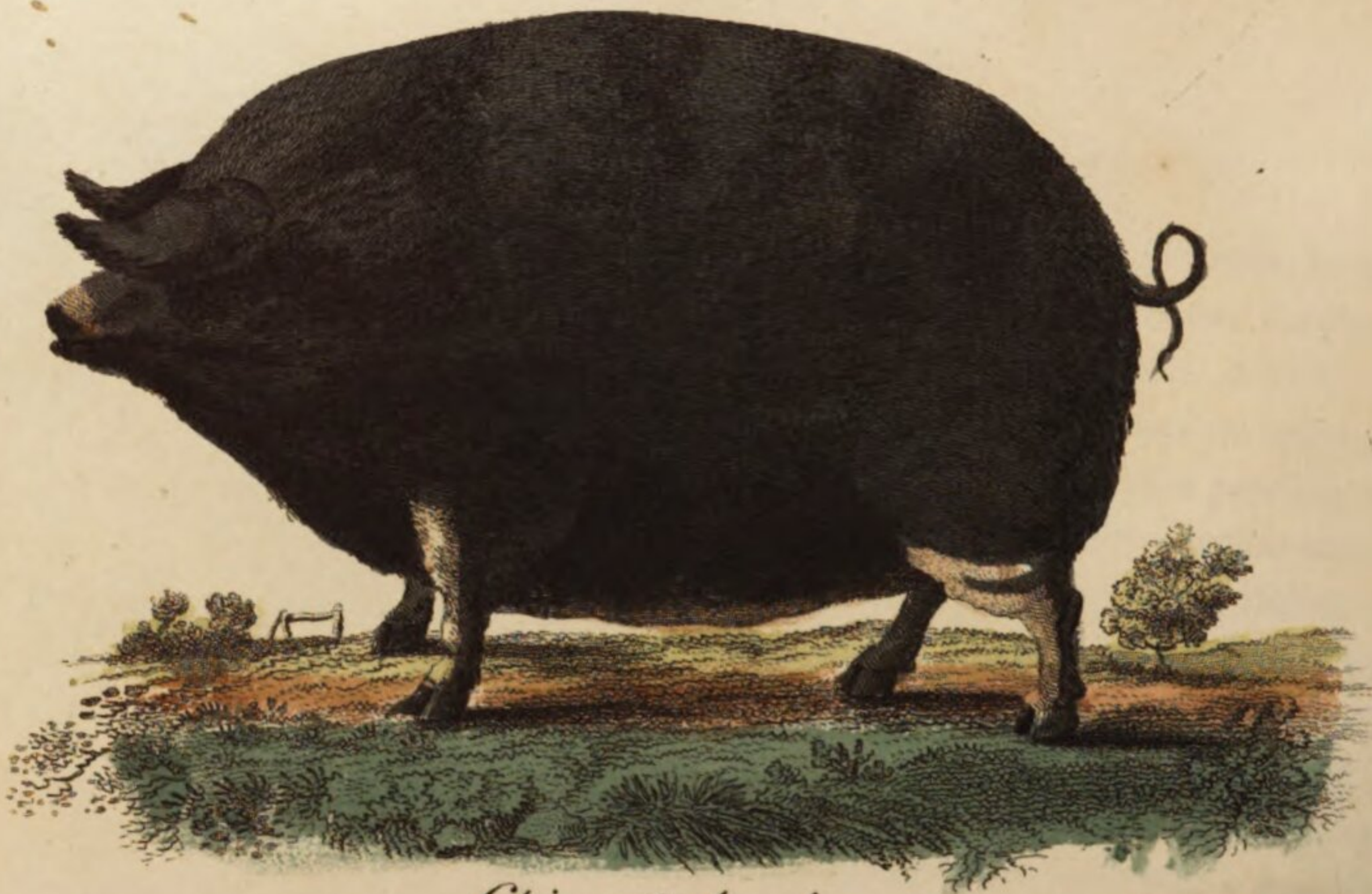
\* Lincolnshire Corrected Agricultural Report.

† Denny on the Diseases of Horses.

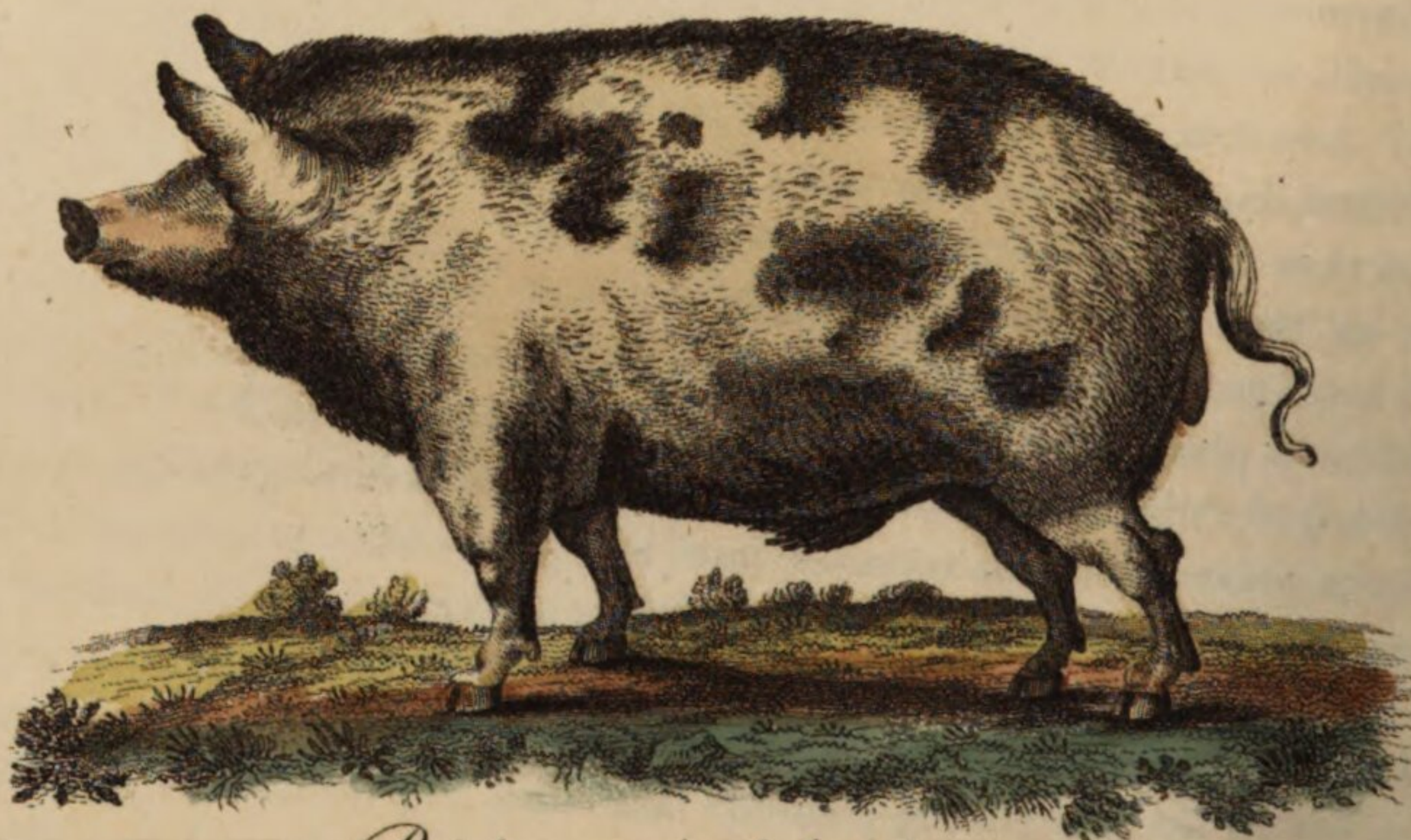




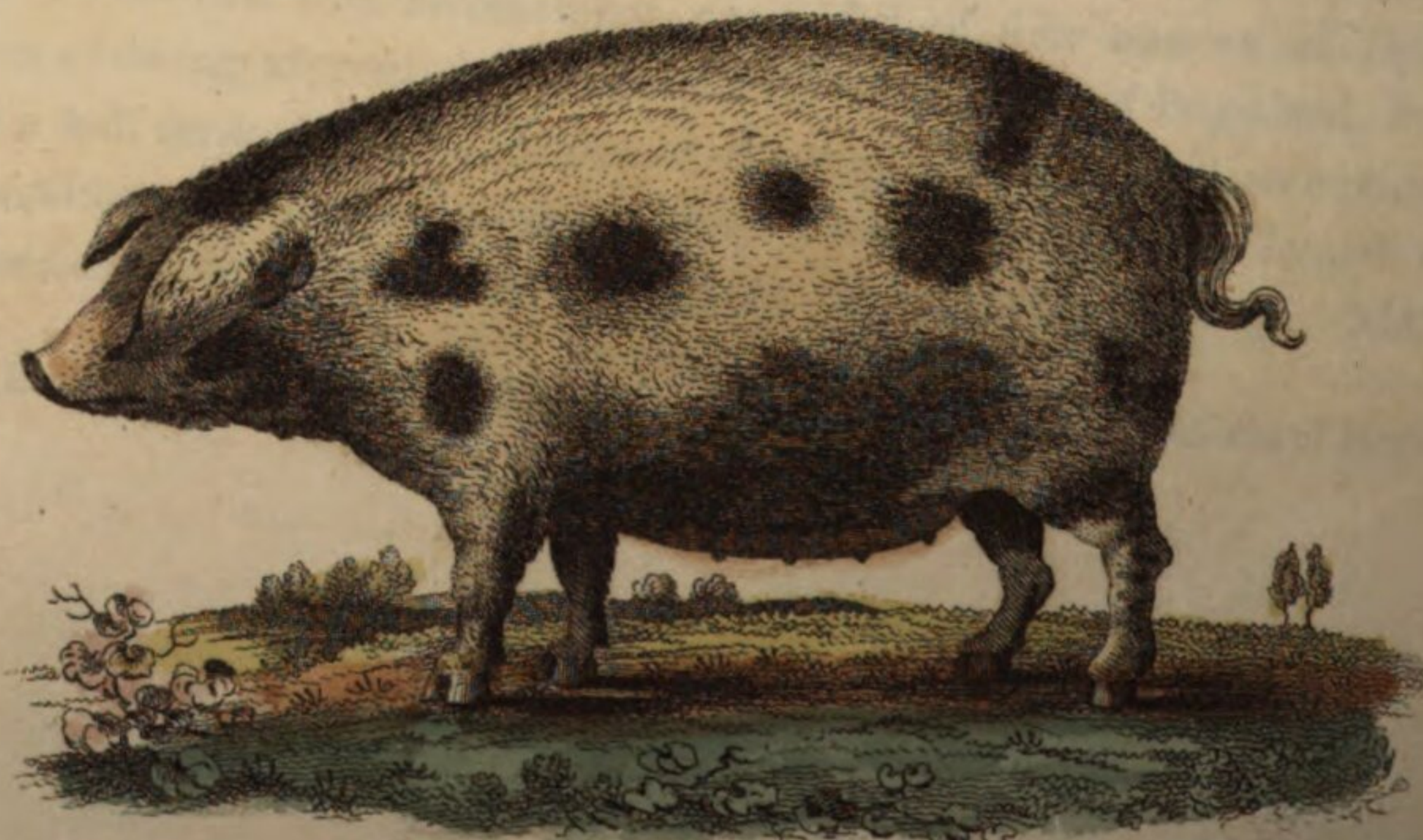




*Chinese breed.*



*Prickear mixed breed.*

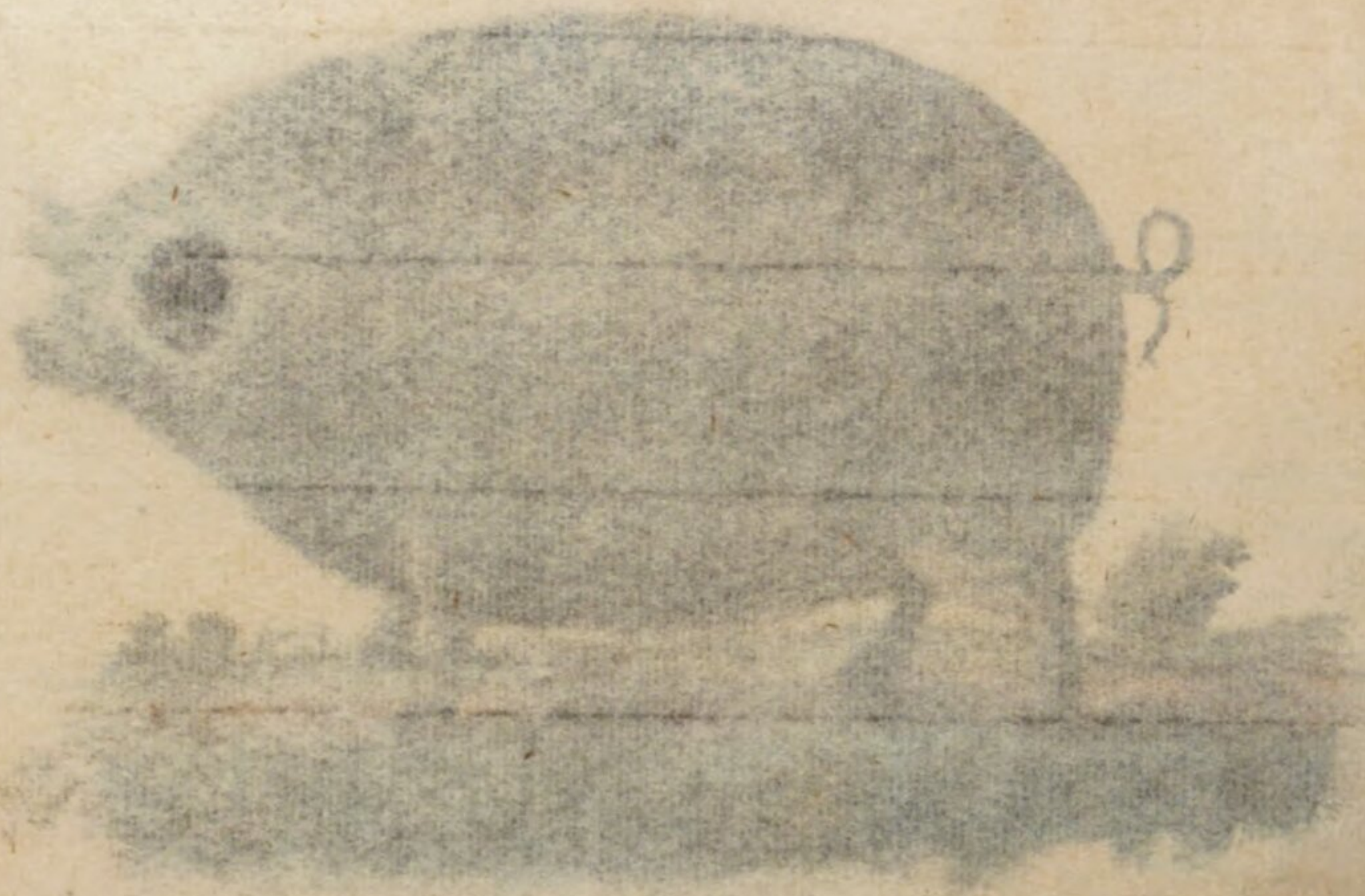


*Berkshire mixed breed.*









*Landrace mixed breed.*



*Berkshire mixed breed.*



nitre dissolved in them are also extremely useful in this complaint. When the disease disappears, the horses should be turned to grass if the season admits.

*Swine.* These are a sort of live stock that bring considerable profit to the farmer, when proper attention is bestowed in the breeding, rearing, and other management. The well-formed hog should not be too long, but full in the head and cheek, thick and rather short in the neck; fine in the bone; thick, plump, and full in the carcase; full in the quarters, fine and thin in the hide, and of a full size in proportion to the kind, with a disposition to fatten well at an early age. The breeds of these animals are very numerous, as almost every district is in possession of a different sort. Of the larger kinds the most valuable breeds are probably the following:

The *Berkshire breed*, which is distinguished by being in general of a tawny or reddish colour; spotted with black; large ears hanging over the eyes; thick, close, and well made in the body; legs short; small in the bone; disposition to fatten quickly.

This useful breed has extended itself from the district which furnishes its name, over most parts of the island. It is the sort mostly fattened at the distilleries: it feeds to a great weight, and is good for either pork or bacon.

The *Hampshire breed* of hogs is very large, being longer in the body and neck, but not of so compact a form as the Berkshire; they are mostly of a white colour, and are well disposed to fatten, coming up to a great weight when properly managed.

The *Shropshire breed* is another large sort of hogs, which are found valuable where the keep is in sufficient abundance for their support. They are not so well formed as those of the Berkshire kind, or equal to them in their disposition to fatten.

The *Gloucestershire breed* is likewise a large breed, but inferior to either of the above, being tall and long in shape, and by no means well formed. The colour is in general white. Mr. Marshall supposes this to have been formerly the prevailing breed of the island. It is supposed to be thinner in the skin than the Berkshire breed.

The *Herefordshire breed* is also a large useful breed, but without possessing any advantage over those that have been mentioned.

It is remarked by the author of the Survey of Middlesex, that the largest breed in the island is supposed to be kept about Rudgewick on the borders of Suffex and Surry. They feed to an extraordinary size, and weigh at two years old nearly double or treble the usual weight of other sorts of hogs of that age. As large breeds pay the farmer the best in many cases, such a breed deserves to be attended to.



Among the smaller breeds of these animals there is much variety.

The *Chinese breed* is distinguished by the neck being thick; the body very close, compact, and well formed; the legs very short, and the size small; the flesh delicate; the colour various, as white, brown, and tawny. This breed is particularly disposed to fatten in an expeditious manner, and has, in consequence, spread over a great part of the kingdom. It is the most adapted for being used as pork, but is much too small for being cured as bacon.

Another breed of the small kind of hogs is met with in many districts; it is of a white colour, thick, compact, and well made in the body; short in the leg; the head and neck well formed, and the ears flouching a little downwards. It is well disposed to fatten, and perfectly hardy.

The *Swing-tailed breed* is an useful sort of the smaller kind of hogs, being hardy in its nature, and of considerable weight in proportion to its size.

Some farmers prefer mixed breeds, as being more beneficial than either the large or small perfect breeds. Where this is the case, the Berkshire, with a cross of the Chinese, has been found a very profitable sort, as being capable of feeding to a considerable weight with a moderate proportion of food.

In order to have hogs of the most perfect kinds, the same attention should be paid in the breeding of them as in other sorts of animals, by selecting the most perfect and best-formed males and females of the several breeds, and carefully raising the stock from them. Those intended to be kept as sows and boars should be constantly well fed from the first, as, where they are pinched for food, they are never so fine or healthy afterwards.

The breeds of hogs, like those of other animals, should be provided according to the nature of the keep. Where it is abundant, or cultivated solely for the purpose of the raising of pigs, the large breeds will mostly be found the most advantageous, as the difference in the proportions between the living and the dead profitable weight, is said by some to be always the least in the largest-sized animals\*.

It is of the utmost importance in the management of swine, both in the view of economy in the labour of their attendance, and the raising of a large proportion of manure, as well as the advantage of the hogs, to have convenient styes or piggeries. The methods of constructing these, with the greatest advantage in these different respects, have been described. It is remarked by Mr. Young, that a piggery "must be in a circle, or it must fail in convenience. In the centre, the boiling- or steaming-house, with a granary for corn, meal, bran, &c.; a range of cisterns in divisions around

\* Knight in Communications to the Board of Agriculture, Vol. II.



MACHINE FOR WEIGHING LIVE STOCK.

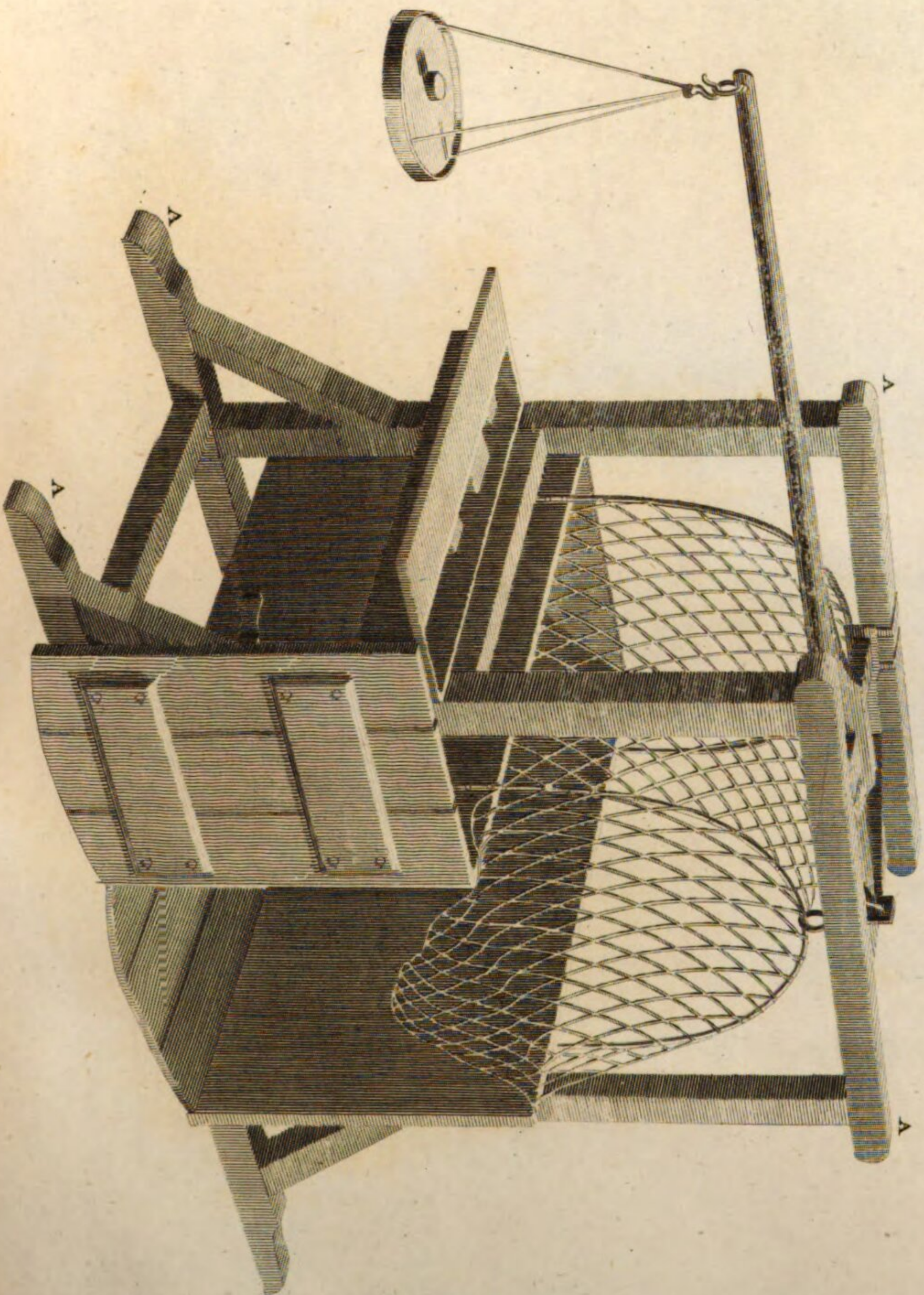








PLATE XXXIV.

*Machine for weighing Live Stock.*

[To face Page 1192, Vol. II.]

**THIS** machine is constructed on the principle of the common steel-yard.

A A A A, a strong wooden frame, with steel centres, in which the pivots of the lever are hung.

On the short side of the lever is suspended a coop, surrounded by strong net-work, in which the animal intended to be weighed is placed; the point of suspension is connected with the coop by means of two curved iron rods, which at the same time form the head to the same; a common scale is hung on the longer side of the lever. By this contrivance any small animal may be very easily and expeditiously weighed, and at the same time with a sufficient degree of accuracy.

I



PLATE XXXIV.

Machine for weighing Live Stock.

[To See Page 192, Vol. II.]

This machine is constructed on the principle of the common steel-yard.  
A A A, a strong wooden frame, with steel contact, in which the points of the lever are  
hung.  
On the lower end of the lever is suspended a coop, surrounded by strong net-work, in  
which the animal intended to be weighed is placed; the point of suspension is connected with  
the coop by means of two curved iron rods, which as the frame turns form the head to the  
frame; a common scale is hung on the longer end of the lever. By this contrivance any small  
animal may be very easily and expeditiously weighed, and at the same time with a sufficient  
degree of accuracy.



it, for receiving immediately from the copper or steam apparatus, and also by tubes from the granary; around these a path, then the fence, wall or paling, in which the troughs, with hanging lids, for supplying food directly from the cisterns on one side, and for the hogs feeding on the other; a range of yards next, and another of low sheds beyond; and last of all, the receptacle for the dung. The potatoe stores (*pyes* as they are called) should be at one end or point near to the entrance, and water must be raised to the coppers and cisterns at once by a pump; a trough or other conveyance from the dairy to the cisterns, for milk, whey, &c. Such an arrangement will be very convenient, and the expense need not be considerable. To annex a certain space of grass, or artificial grasses, in divisions, into which the hogs may be let at pleasure, is an addition of admirable use if the spot permit it. Those who do not possess a convenient pig-apparatus, can have little idea of the great use of it in making manure. This alone becomes an object that would justify any good farmer in going to a certain expense, for attaining so profitable a part of what ought to be his farm-yard system. In nine-tenths of the farmeries in the kingdom, it is lamentable to see so many parts of a right piggery scattered and unconnected, in such a manner as to preclude convenience, increase labour, and prevent the making of dung\*.”

\* In a hoggery, built by the author in 1765, nearly, but not exactly, on this idea, the expenses were as below:

|                        | £.    | s. | d. |
|------------------------|-------|----|----|
| The boiling-house      | 18    | 18 | 0  |
| Copper                 | 13    | 0  | 0  |
| Pond                   | 4     | 0  | 0  |
| Pump                   | 1     | 10 | 0  |
| Cisterns               | 14    | 0  | 0  |
| Shed                   | 6     | 15 | 0  |
| Paling                 | 7     | 7  | 0  |
| Paving                 | 10    | 0  | 0  |
| Troughs                | 3     | 0  | 0  |
| Total, besides timber, | £. 78 | 10 | 0  |

By means of one of these yards he fattened eighty-eight hogs in spring 1766 with only one man to attend them; whereas three would not have been sufficient without such conveniences. They were littered with nine loads of straw and haulm that cost 6l. 18s.; and this made ninety loads of very rich dung, valued by several farmers on the spot at 5s. a load.

|                            | £.    | s. | d. |
|----------------------------|-------|----|----|
| Value of dung at that rate | 23    | 10 | 0  |
| Straw, &c.                 | 6     | 18 | 0  |
| Profit in dung,            | £. 16 | 12 | 0  |



It is added that, "with such a convenience, all the pease, beans, barley, buck-wheat, potatoes, parsnips, carrots, &c. that are or can be raised on a farm, may be applied to the rearing, feeding, or fattening hogs; by which means the farmer has the opportunity of improving his land to the highest degree, and at the cheapest rate possible."

The sow is capable of propagating at seven or eight months old; but it is better to defer her taking the boar till ten or twelve months, as she becomes more strong and affords better litters of pigs. The period of being with young in the sow is about four months, and the usual produce from about eight to ten or twelve in the large, and more in the smaller breeds, which in general bring the greatest number, and the most early. The boar should be a year old or more before he be put to the sows, as by this delay he attains a better growth, and is more vigorous.

As there is great difficulty and expense attending the rearing of young pigs in cold seasons, the farmer should contrive as much as possible to have his litters early in the spring and autumn seasons, as about the beginning of April and the latter end of August or beginning of the following month, as at these periods much less loss will be sustained in the death of the pigs, and less expense incurred in food. The litters which are pigged in June, or the early part of the following month, should always be reared, as being highly profitable. But it is seldom advisable to keep the late autumn litters, as the cold in the winter is almost sure to destroy many of them.

When swine are made an object to the farmer, great care should be taken to have a good boar constantly along with the sows, in order that a proper succession of young pigs may be produced. By this means the sows are likewise induced to take the boar sooner than would otherwise be the case.

In the management of hogs it is of great consequence to keep the different

But it is observed that they had not half the litter they ought; or they would have made 35l. worth of manure, beyond doubt.

Ninety loads costing 6l. 18s. is 1s. 6d. per load.

"These particulars, surely (says he) must prove the vast importance of such conveniences for fattening great numbers of swine, for the mere purpose of raising manure. Suppose the expense, timber included, to be 110l. and the interest called 5l. what comparison is there between the expense of 5l. a year, and the prodigious utility of having it always in your power to fatten, with scarce any expense of labour, whatever number of hogs you please?"

"The total expense at present of such yards would not be less than 150l.; and if made conformably to the more correct idea, would be 200l. or 250l. But the governing idea of position should be followed in styles of 20l."



forts separate and distinct from each other, as the sows in pig, those with pigs, and the stores according to their ages. It is only in this way that they can be kept to the most advantage. At the time of pigging it is necessary also that each sow should be kept in a separate sty, in order that there may be no interruption or disturbance from the others coming about her. About this period, likewise, more than ordinary attention should be bestowed on the sows, and the styes kept but thinly littered, in order that accidents may be avoided.

As the breeding of pigs is a business that affords the farmer a considerable profit and advantage in various views, it is of essential importance that he be provided with suitable kinds of food in abundance for the support of the numerous sows that it will be necessary for him to keep, and the great number of pigs that must be raised. Upon this being properly and effectually done his success and advantage will in a great measure depend. The crops capable of being cultivated with the most benefit in this intention are beans, pease, barley, buck-wheat, potatoes, carrots, parsnips, Swedish turnips, cabbages, lettuces, clover, lucerne, chicory, &c. The proportions in which these crops should be grown for this purpose must vary according to circumstances; as the kind of hogs, their extent, and the manner of disposing of them: but whatever number may be kept, an equal proportion of root crops and those of the grass kind will be requisite, with about half as much of those of the farinaceous or grain kind as of those of the root sort; and a quantity of the luxuriant vegetable kind, fully in proportion to the number of hogs that are to be fed on such sorts of food.

In the supplying of the hogs with food a distinction is likewise to be made according to the different kinds, in order that the most may be made of the food. The sows considerably advanced in pig, and those with pigs, should be fed in a better manner than the store pigs. The former should be supplied with good wash twice or oftener in the day, and have a sufficient allowance of cabbages, potatoes, carrots, or other similar vegetables, so as to keep them in good condition; which is shown by the gloss of their coats. The sows with pigs should be kept with their litters in separate styes, and be still better fed than those in pig. Where dairying is practised, the wash of that kind which has been preserved for the purpose while the dairying was at the height, in brick cisterns, constructed for receiving it from the dairy, must be given them, with food of the root kind, such as carrots, parsnips, potatoes and cabbages, in as large proportions as they will consume them, in order that the pigs may be properly supported and kept in condition. But where the business of dairying is not carried on so as to provide wash of that sort, meal of some kind or



other must be had recourse to for the making of wash, by mixing it with water, which, in the summer season, will be sufficient for their support; and in winter it must be blended with the different sorts of roots prepared by boiling, or, when for the young pigs, with oats and pea-soup \*. With this soup and dairy-wash, where proper attention is bestowed, young pigs may be weaned and reared in the winter season even with profit and success. The pea-soup is an admirable article when given in this intention: it is prepared by boiling six pecks of peas in about sixty gallons of water, till they are well broken down and diffused in the fluid; it is then put into a tub or cistern for use. When dry food is given in combination with this, or of itself, Mr. Young advises oats, as being much better than any other sort of grain for young pigs, barley not answering nearly so well in this application. We have employed oats coarsely ground for young hogs with the best success, both in the form of wash with water and when made of a thicker consistence.

Where the sows and pigs can be supported with dairy-wash and roots in the manner just mentioned, there will be a considerable saving made by avoiding the use of barley-meal, pease, or bran and pollard. It is therefore highly disadvantageous to the farmer to have recourse to such substances in these circumstances.

There is another point to be particularly regarded in the management of sows and pigs, which is that of keeping them constantly well littered down with clean straw or some other similar article, as by this means they are kept perfectly clean and healthy, and at the same time a large quantity of manure is afforded.

In the practice of cultivating crops of various kinds purposely for the food and support of swine, the sows and store pigs will of course be supported during the winter season, as from the beginning of November to the middle or latter end of May, by the various roots that have been stored in this view, such as potatoes, carrots, parsnips and Swedish turnips; also cabbages in their fresh state, in combination with the preserved dairy-wash, and other articles that have been noticed above. At the latter of the above periods the whole of the hogs in the yards should be looked over and sorted; such as have attained half or more of their growth being drawn and turned upon the clover, lucern, or chicory crops, where they should be kept till towards the latter end of September, the fences being kept in perfectly good order, and ponds or other places provided for the hogs to drink at. Under this management they are found to grow rapidly, the food in general agreeing well with them, and they are then taken up in excellent condition for being fattened. In this practice the important difference from the former method is in selecting the suf-



ficiently-grown hogs from the fows that have pigs and the weaned pigs, and only leaving the latter to be fed with the dairy or other wash, with suitable green food, such as lettuces, cabbages, tares, &c. by which a much larger stock of breeding hogs may be kept\*. The tares and cabbages may be used for the fows that have spring litters, and the lettuces for those that have autumn litters. In the cultivation of this plant in this intention, Mr. Young directs that the land should be well manured, and brought into a very fine clean state by being ploughed in the close of the year into ridges of a suitable size for the drill machine, being scuffled over in February and again in March; then well harrowed, which should be again repeated before drilling, which must now be performed in the proportion of from half an acre to an acre, according to the extent of hogs that are kept. The rows must be equidistant, at about one foot asunder; and in order to have a proper succession of these plants more should be put in in April or later. The crops must be kept constantly well weeded, and thinned in the rows by hand, to the distance of about nine or ten inches, as if this be neglected the plants are drawn up weak and poor, never succeeding well. At the time they are six inches high, they should be horse-hoed with a scarifier, or scuffler, with the hoe four or at most five inches in width.

These plants are of excellent use for fows and pigs, promoting the increase of milk in a great degree; they afford great assistance where the dairies are small, and in all cases tend to prevent the consumption of grain, which is of great importance in hog-management. From the sweet and saccharine quality of the plant, the hogs are not only extremely fond of it, but it becomes highly nutritious. By these means the swine will be well supported and carried forward till the time the stubbles are cleared, when they may be turned upon them, and thus the whole year be provided for in these different ways.

But though this system of management is advantageous, that of soiling the hogs in their yards with green food, cut fresh in the way that has been already directed, is considered by Mr. Young, notwithstanding the increased expense that attends it, and the waste of a certain portion of the food, as highly preferable on account of the vast store of manure that may be raised. But it cannot be attempted with propriety unless the farmer be provided with abundance of some sort or other of materials for the purpose of litter, and substances of the peaty or earthy kinds for the purpose of covering the floors of the hog-yards, in order to absorb and prevent the waste of any portion of the liquid matters that may fall upon them. In this method of proceeding, clover, chicory, tares, and lucern, are the kinds of food that are most

\* Young's Farmer's Calendar.



commonly employed; but there are others that may be brought in to their assistance when necessary, especially on the stronger sorts of lands, such as beans eaten green, which afford a large quantity of food in proportion to the land they occupy, the whole stems being consumed; and cabbages may likewise be had recourse to for the summer as well as winter food of these animals. It is recommended by Mr. Young, that the yards of the hog-sties should have gates sufficiently large for bringing in carts loaded with the different articles of both food, floors, and litter, as well as for removing the manure that is made.

In this management, instead of a few sows only being kept, as was usual in combination with the dairy system, great numbers may be maintained, and a great many young pigs be raised. But in order to derive the greatest advantage from this system of hog-management, Mr. Young thinks it should as much as possible be so contrived that the sows only pig twice in the year, as has been mentioned above; as by this means there will "never be a long and expensive season for rearing the pigs before they are put to the staple food of clover or potatoes, &c. But this circumstance is much removed by the provision of crops raised expressly for swine."

In this scheme of keeping swine, the sales for lean hogs should, he observes, annually take place in October, the litters of April being then disposed of as stores, and those of August kept till the same period in the following year, in order to be sold as baconers, when none are fattened on the farm.

The expense of keeping all sorts of store-swine must obviously vary considerably according to the convenience of procuring their food, and the excellence of the management that is pursued. In suckling-sows it has been estimated upon the average at from eighteen pence to three shillings the week, and while in pig at from one shilling to eighteen pence; weaned pigs at first from one shilling and sixpence to two shillings and sixpence per head, and afterwards till they are become fully grown at from one to two shillings each per week. Such calculations must, however, be liable to differ greatly in different cases.

The breeding of pigs is a system that deserves the farmer's attention, not only as obtaining his pig-stock at a much cheaper rate than by purchasing at the markets, but as being certain of having them more healthy and well fed, consequently such as will answer much better in their growth and fattening afterwards.

The fattening of hogs is a business usually performed at two different seasons of the year, as in October and in February or March: the former is, however, the most principal period. In this management various substances have been recommended; but those most commonly employed are some sort of farinaceous



material, with skimmed milk, and dairy or other kinds of wash. For the smaller sorts of fattening hogs, coarsely ground oats mixed with these washes are excellent. Barley meal and pollard are likewise frequently made use of for the purpose with much success. The meals of pease and beans, when given in sufficient proportions for the purpose of fattening, are apt to heat them too much, and produce a difficulty of breathing; but for the large or full-grown hogs, pea-meal or pease unground are probably the best material that can be made use of. A portion of bean meal, or whole beans, may likewise be given occasionally with advantage, as both these articles contain a much larger proportion of nutritious matter in the same bulk than any sort of grain, and are more lasting in their effects on the system, from their undergoing the process of digestion more slowly, perhaps on account of their containing a larger proportion of oil in their composition\*. Malted barley given whole has likewise been found highly beneficial in the fattening of hogs, the quantity of saccharine nutritious matter being thus greatly augmented†. Acorns in the same state have likewise been found to fatten hogs, but they cannot be depended on as a food for this use. Potatoes and carrots have also been occasionally tried in the same application; but as they never answer well without being boiled and combined with the meal of some sort of grain, it is a much better and more economical practice to convert them to the purpose of store feeding, and depend upon farinaceous substances for fattening. The various experiments of Mr. Boys of Kent, detailed in the twenty-ninth volume of the *Annals of Agriculture*, sufficiently show the disadvantage of this method. Even when the potatoes were boiled and blended with barley-meal, he sustained considerable loss in this mode of fattening. There is, however, another method of fattening, which, in particular situations, may be practised with profit and success, which is that of employing the wash of large distilleries with grains and some sort of meal. In the first part of the fattening the grains and wash are given, and in the latter the meal‡.

The quantity or weight of pork produced by a given quantity of pease, beans, meal, or other materials employed in the fattening of hogs, has not been well ascertained, and it is probable that a great deal will depend upon the size, breed, and disposition to fatten; but, judging from the value of the animals before and after they have been fattened, it is concluded by Mr. Knight, that a Winchester bushel of the first of the above articles may add about nine or ten pounds to the weight of a good hog of twenty score, or perhaps something more upon a larger, and confi-

\* Darwin's *Phytologia*.† *Synopsis of Husbandry*.‡ *Annals of Agriculture*, Vol. XXIII.



derably less on one of a small size \*. A hog put up to fatten in good condition, and they should never be put up in the contrary state, which when fat will weigh twenty score, will consume in the proportion of six or seven bushels of pease †.

In regard to the method of giving the different materials that are employed in the fattening of swine, there are different opinions entertained; some contending that they should be used as much as possible in a solid form, wash, as drink, being occasionally used; while others prefer the contrary method as the most beneficial: as in the latter mode there will be less time taken up by the hogs in feeding, and of course more left for them to sleep and rest in, as well as more economy in the food and the labour of giving it, it is probably the most advisable. It has indeed been observed by Mr. Young, in his excellent Calendar of Husbandry, that "the most profitable method of converting corn of any kind into food for hogs is to grind it into meal, and mix this with water in cisterns, in the proportion of five bushels of meal to one hundred gallons of water, stirring it well several times a day for three weeks in cold weather, or for a fortnight in a warmer season, by which it will have fermented well and become acid; till which time it is not ready to give." This mixture should always "be stirred immediately before feeding," and "two or three cisterns should be kept fermenting in succession, that no necessity may occur of giving it not duly prepared. The difference in profit between feeding in this manner, and giving the grain whole or only ground, is so great, that whoever tries it once will not be apt to change it for the common methods." It is added that "pea-soup is an excellent food for hogs, and may, though he has not sufficiently compared them, equal the above, especially if given in winter, milk warm." But wherever food is prepared by heat, the expenses of fuel and labour are a great drawback on the profits of the system. It should therefore be well considered before it is undertaken. But in whatever way the food be given, great care should be taken that the hogs have a full allowance at sufficiently short intervals to keep them constantly in a state of rest, as it is on this principle that they become fat in an expeditious manner. It is a fact frequently observed in fattening hogs, that they pay better for their keep in the latter part of their fattening than in the former; which probably arises in some measure from their not being fed in a sufficiently full manner, or with sufficient frequency in the beginning, so as to keep them in a state of rest.

The length of time that is necessary in fattening these animals must vary much according to the state in which they are put up, their sizes, and the differences in

\* Communications to the Board of Agriculture, Vol. II.

† Ibid.



their dispositions to fatten, but in general from five or six weeks to two or three months is sufficient.

In the time of fattening, it is likewise of great importance to keep the hogs clean and warm, by having them frequently well littered down, as by this means they not only fatten more quickly, but the most manure possible is raised. The advantage of warm sties, with warm food in cold weather, has been found very considerable.

It is the best method to have the pigs castrated while young. The male pigs are usually gelded at about three weeks old without danger, and the female ones may be cut or spayed when a month old; though, in the latter case, the operation is frequently performed at a much later period. The sows, when not wanted for the purpose of breeding, may also be spayed: this business is mostly done by persons who are in the constant practice of it.

It is absolutely necessary to keep all sorts of swine constantly well ringed, in order that they may lie quietly in the sties, and of course thrive better.

A great mistake seems to have been committed by farmers in the management of hogs, from the supposition that they can only be kept with profit in so far as they may consume the materials that would otherwise be wasted. There cannot, however, be any doubt but that swine will pay for their keep as well as any other sort of live stock, where a judicious system of cultivating crops purposely for them is pursued. This is fully shown by the various statements that have been made on the subject.

There are different ways of curing the flesh of hogs, according to the intention for which it is designed. When cured as bacon, it is the practice in Kent to singe off the hairs, by making a straw fire round the hog, an operation which is termed *swaling*. "When the flitches are cut out they should be rubbed effectually with a mixture of common salt and saltpetre, and afterwards laid in a trough, where they are to continue three weeks or a month, according to their size, keeping them frequently turned; and being then taken out of the trough are to be dried by a slack fire, which will take up an equal portion of time with the former; after which they are to be hanged up, or thrown upon a rack, there to remain till wanted."

In the making of bacon on the continent, it is frequently the custom to have closets contrived in the chimneys, for the purpose of drying and smoking them by means of wood fires\*.

Another method of curing this sort of meat is that of salting it down for pickled pork, which is far more profitable than bacon. After the hog is cleansed of the

\*.Bradley on Husbandry and Gardening.



hair, and the head taken off, together with the legs and hands, and the necks, loins, and all the lean bones cut out, which will amount to nearly two-thirds of the whole hog, the remaining part, which is the fat or prime pork, is to be cut into pieces of a size proportioned to the circumference of the salting-tub, and every piece rubbed on each side and on every part with common salt, having some beaten saltpetre sprinkled on each. The bottom of the tub should also be covered with salt, and when the pork is sufficiently powdered, the pieces laid in, with the rind upwards, and every one pressed down with all the strength that can be used, and wedged in so close as to leave no apparent chasms. Over this layer is to be spread a covering of salt, with a very slight sprinkling of saltpetre, as too much makes it hard. In about a month or five weeks the brine will begin to rise, and, in a short time afterwards, cover the whole surface of the tub; but if, from a defect in the salt, it should fail to dissolve into brine within that period, it will be necessary to make a quantity of brine and pour over the pork; for unless the whole be covered with brine it will not keep well. In adding the brine care should be taken not to disturb the pieces of pork.

In the curing of hams in Westmoreland, the method pursued is this: They "are first rubbed very hard, generally with bay-salt; by some they are covered close up, by others they are left on a stone bench to allow the brine to run off. At the end of five days they are again rubbed as hard as they were at first, with salt of the same sort, mixed with rather more than an ounce of saltpetre to a ham. Having lain about a week, either on a stone bench, or in hogsheds amongst the brine, they are hung up by some in the chimney amidst the smoke, whether of peats or coals; by others, in places where no smoke ever reaches them. If not sold sooner, they are suffered to remain there till the weather becomes warm." They are then packed in hogsheds with straw or oat-meal seeds, and sent to the places of sale. It has been found by experiment that hams lose twenty per cent, of their weight in the curing\*.

Swine are subject to a variety of diseases, but few of them have yet been sufficiently investigated to ascertain the proper means of cure. Much exposure to cold is liable to bring on affections of the lungs, by which the animals gradually decline and waste in flesh, having a frequent husky dry sort of cough. Warmth, with good keep of the less dry and heating kinds, would seem to be the most advantageous method of removing such complaints.

When hogs become affected with the mange, care must be taken to separate them from the rest; and after being well washed in soap and water, they should be

\* Corrected Report of Westmoreland.



anointed with an ointment of the same kind as that recommended for the same disease in sheep. A little common sulphur should likewise be given in their food.

In large lop-eared hogs the parts behind them are apt to crack and become sore in hot seasons; in these cases they should be anointed with a little saturnine ointment.

When the udders of the sows take on hard lymphatic swellings, which is sometimes the case, attempts may be made to remove them by the use of camphorated saturnine washes or ointments, care being taken to have the parts clean wiped before the pigs are admitted to suck. In such cases half a drachm of calomel may likewise be exhibited every second or third night for two or three nights.

*Rabbits.*—This is a kind of live stock that can only be employed with profit by the farmer in particular situations, and under certain circumstances. Wherever land is capable of producing tolerable crops of either grain or grass, the system of rabbit-warrens can seldom, if ever, be established with advantage. The hazard and uncertainty of rabbit-management is constantly so great, that it is safer for the farmer to depend upon even moderate crops of either of the above kinds than this. It is only the light barren sandy sorts of land, in such declivities and other situations as cannot be brought under the plough, and which cannot be converted to the purpose of pasture for even sheep, which is in general the proper application of such lands, that rabbit-husbandry is proper to be undertaken upon.

The breeds of this animal are various; but those chiefly employed in warrens are mostly either the *common gray breed* or the *silver gray breed*; the former is most valuable in regard to hardness and flesh, but the latter in respect to skin. The fur of the first sort, which is the most prevalent, is chiefly employed in the hat-manufactories; while the skins in the latter cases are in common dressed as furs for the China market, and are in general nearly double the value of those of the other sort.

This sort of stock, when turned into the land intended for the warren, soon provide themselves habitations, by preparing holes and burrowing in the more dry, light, sandy, and elevated parts, where they safely lodge and propagate their young.

In some warrens in Lincolnshire, they stock in the proportion of three couple to the acre, but in other cases considerably more. One buck is sufficient for a hundred does.

It is necessary to have the warrens well inclosed; not only for the purpose of preventing the stock from straying and being destroyed, but to prevent their being annoyed by different sorts of vermin. This is effected in different methods, according to circumstances, as by walls or paling; but, from the great expense of these fences, more commonly by sod, earth, and turf mounds, or banks and fences coped



or kidded on the top by furze, thorns or ether sorts of brush-wood. This fencing, with that of nets and traps, constitutes the great expenſe of rabbit-huſbandry; which, when added to thoſe of charcoal for drying the ſkins, warreners, men for killing and carrying, horſe-hire, &c. is very conſiderable.

Befides this, though rabbit-ſtock demands, on the whole, but little regard, in ſevere winter ſeaſons it is neceſſary to provide them with additional food, ſuch as hay, turnips, clover, ſaintfoin, and other ſimilar kinds, to be diſperſed about in the warrens. Turnips are the beſt ſort of food in ſnows, as the rabbits can find them by the ſcent. From two to three large cartfulls will be ſufficient to fodder a thouſand couple or more a day. One load of hay may be ſufficient for a day in ſtorms. In ſome diſtricts, billets of new cut wood aſh boughs, gorse, &c. are diſtributed; the bark and other parts of which are conſumed, and the quantity of hay by that means greatly diminifhed. There are likewiſe other expenſes, in clearing away ſnow from the fences, to prevent their eſcaping, and in the deſtroying vermin, as well as for night-watching.

The rabbit begins to breed at eight, ten, and twelve months old, and goes about thirty days with young, which are about twenty-two days more before they appear from the burrows, being ſuckled during that time twice a day by the mother; of courſe they may breed three or four times in the courſe of the year when very well fed, as they are known to take the buck again very ſoon; but in incloſed warrens they rarely breed more than twice in the year. The annual ſale of produce is in general eſtimated at from three to eight couple per acre, affording a profit of eight or ten ſhillings, or more under good management\*. The produce is the greateſt on new land†; but much in reſpect to profit muſt depend upon ſituation, as when it is near to large towns, where there is a conſtant demand for the rabbits as food, it muſt be greater than in other caſes. They are in ſeaſon from the beginning of November till the commencement of the enſuing year, during which period the prime ſkins are afforded; therefore the greateſt part muſt be killed in this ſhort interval. There is annually a great loſs in what are termed *half ſkins*, *quarter ſkins*, and *racks*, fixteen of which are only allowed for as one whole ſkin. Rabbits are ſold by the hundred, fix ſcore couple making the hundred‡.

\* Young's Agricultural Survey of Lincolnſhire.

‡ Ibid.

† The following eſtimate of the warren on the eſtate at Thoreſway, is given by Mr. Young on the authority of Mr. Holdgate, the tenant, who ſtates the expenſes of 1700 acres under the ſilver ſort of rabbits, thus:



They are taken either by means of nets or traps. In the former method the nets are set in the form of a fold, between the burrowing places and the feeding grounds, in the night or early in the morning; the rabbits being hunted into them in their return from feeding.

|                                                                   | £.  | s. | d. |
|-------------------------------------------------------------------|-----|----|----|
| Labour, three regular warreners, with extra assistance at killing | 85  | 0  | 0  |
| Fences                                                            | 42  | 10 | 0  |
| Winter food                                                       | 42  | 10 | 0  |
| Nets, traps, &c. &c.                                              | 14  | 3  | 4  |
| Delivery                                                          | 21  | 5  | 0  |
| Rent is said to be 7s. an acre                                    | 595 | 0  | 0  |
|                                                                   | 800 | 8  | 4  |

The capital employed is that sum, with the addition of stock paid for;

suppose this, as stated above, 3 couple an acre, at 2s. 4d.

595 0 0

Interest of that sum one year, 5 per cent.

1395 8 4

69 5 0

1464 13 4

#### Annual Account.

Expenses as above

800 8 4

Interest

69 5 0

869 13 4

Produce 10,000 couple, at 2s. 4d.

1166 13 4

Expenses

869 13 4

Profit

297 0 0

or 24l. per cent. (the five per cent. included) on capital employed. "This is (Mr. Young observes) very great, reckoned on the capital, but small reckoned by rent, as it amounts to only half a rent. But suppose the gross produce of 1500l. which he takes to be nearer the fact; then the account will stand thus:

|          |      |   |   |
|----------|------|---|---|
| Produce  | 1500 | 0 | 0 |
| Expenses | 869  | 0 | 0 |
| Profit   | 631  | 0 | 0 |

or 47l. per cent. on the capital.

"Take it how you will, he thinks it explains the reason for so many of these nuisances remaining. The investment of a small capital yields an interest that nothing else will; and thus the occupier will be sure never to convert them to better uses. But what says the public interest? Here are only 200l. expenses to 600l. rent; what is the population, the industry, the improvement! The landlord gets the lowest of rents, the tenant makes a good profit; they divide all, and the rest of the world are little the better for them."



The traps are constructed by forming large pits dug in the way of their most frequented tracks, and covered by a sort of folding door, towards the centre of which is a sort of small trap door, to which they are led by a narrow track or meuse. The rabbits, being thus taken, are sorted according to circumstances.

A very great objection to these animals is their destroying the corn, new sown grasses, turnips, and even the quick hedges that are in the vicinity of them.

In raising tame rabbits, the principal points to be regarded are those of having such stock as is perfectly free from disease, keeping them quite clean, dry, and free from all sorts of filth, with a sufficient protection from cold in severe weather. The feeding should be performed regularly, in small quantities at a time, and a due proportion kept up between the dry and moist green vegetable food: the most proper kinds of each sort of which are, those of clover, parsley, endive, dandelion, cabbage-leaves, carrot-tops, &c. with good green rouen or clover-hay, pea-chaff, oats, pollard, and bran. They usually breed at the age of six months, and mostly three or four times in the year, especially when kept sufficiently warm in the winter season; at this time a little dry hay should be placed in the hutch: the young may be weaned at six or eight weeks old, and the buck admitted. The young rabbits ought to be carefully separated when they become of any size, and never be suffered to be in any degree crowded together, as in such cases they soon become diseased.

*Poultry.*—This is a species of stock which, from the trouble and uncertainty that attends it, is of doubtful advantage, except in particular situations and circumstances. The term poultry comprehends several different sorts of birds that have been considered as stock for the farm-yard.

*Common Fowls.*—Of these there are various breeds, as the *game breed*, the *English* or *white breed*, the *Poland* or *black breed*, the *Darking breed*, the *Shackbag breed*, the *Malay breed*. The two first of these breeds are much smaller than the others. As this sort of stock, when under a proper system of management, affords advantage both in the eggs and the chickens, it may be necessary to observe that the game and Poland breeds are in general the best layers, but that in respect to the size of the eggs the larger breeds are preferable. As setting- and breeding-fowls, the Darking and other large breeds are probably the best; but in what regards the colour, quality, and flavour of the flesh, the game and the white breeds are supposed by those who indulge in this sort of food to be the most delicate.

In the management of poultry much depends upon proper conveniencies being provided for them. The method of constructing houses for this use has been



already described. In order that there may be the least possible interruption to the poultry, it is necessary that separate places be provided for the purposes of their roosting, sitting, and being fattened in, as well as for containing their food; and, where the quantity kept is very considerable, for plucking and preserving their feathers in; as by this means the system may be conducted to the greatest advantage. And where an attendant is kept for the purpose of feeding and taking care of this sort of flock, it may be of consequence to have the place which is designed for lodging in so situated, as that the smoke which it affords may pass through the roosting- and sitting-rooms, as it has been long known that the smoke, as well as warmth thus communicated, is particularly grateful to the poultry, and highly promotes their breeding and thriving. This is sufficiently shown by the vast quantities that are raised in the warm smoky cottages in Scotland and Ireland.

In addition there should also be the conveniences of a yard, in which they may pick up sandy or gravelly particles, with a small grass paddock for ranging in, in which there must be a supply of pure water. The whole of the internal parts should be kept perfectly clean and free from vermin, by being frequently washed out and lime-whited.

In setting both the hen and the turkey, in order to prevent their inconveniencing each other, separate nests should be provided in situations where they can be confined and kept from the rest; as without this precaution the same nest will have two or three upon it; by which much injury may be sustained.

Hens may be kept in the proportion of about six or seven to a cock. Young ones are the best where eggs are the principal object; but where chickens are chiefly in demand the older kinds should be preferred, as they sit with more assiduity and closeness. Young hens mostly begin to lay in January, or early in the following month; but this may be greatly promoted by the use of food of the more stimulant kind given with the grain, as buck-wheat, barley, hemp-seed, fenugreek, &c. in which intention any kind of refuse animal matter chopped very small has been found highly beneficial, also any of the small sorts of fish, such as sprats, &c. prepared in the same manner. But whatever sort of food may be employed for the laying hens, it is essential to their producing a great number of eggs that they be not too much fed, though they should not be kept too poorly, as from each extreme disadvantage may proceed.

The periods of setting hens must necessarily vary according as chickens are wanted, but in general the latter end of February or the beginning of the following



month is a good season for the purpose; as the weather will be getting warm about the time they are hatched. The period of sitting is usually about twenty-one days.

In setting the hens, the eggs should always be such as are new-laid and perfectly fresh, and the number should not exceed a dozen. While sitting, the hens should constantly have a sufficiency of food near them, in order that they need not be taken from their nests too great a length of time. In the time of hatching, some advise the removing the first brought out chickens; but it is probably a better practice to let them remain, to be supported by the natural warmth of the hen until the whole brood is out. At this time some recommend their being put under a coop with the hen; but where the poultry-yards are well inclosed they may be suffered to follow the mother. Where there are more broods than one, the coops should not be placed too near each other, lest the hens should destroy each others' chickens. It is best to feed the chickens first with steeped rice or split grits with boiled potatoes bruised; but afterwards the refuse wheat or barley may be given them with propriety, after having been boiled or steeped some time in water.

The proportions in which these sorts of food are consumed by young chickens vary according to their size; but in general it may be reckoned from one to two ounces per day, while they are in the early part of their growth, as from half a pound to two and a half pounds weight or more. In about ten or twelve weeks chickens mostly become pretty fully grown. It is necessary to prevent young chickens as much as possible from picking up slugs, snails, and other similar animals from the ground, and also to keep them as free as possible from the wet, as by these means they are extremely liable to become diseased.

Various directions have been given for the fattening of poultry; but the best practice is probably that of confining them for a few days in dry well-ventilated places, which are covered so as in some measure to prevent the entrance of too much light, the fowls being previously kept in good condition in the poultry-yards. In these situations they should be regularly fed three or four times in the course of the day with well-steamed potatoes, which are probably the cheapest sort of food; as near Liverpool, in Mr. Wakefield's practice, which is upon an extensive scale, it has been attended with the most complete success, the poultry thriving perfectly well. Buck-wheat is likewise an useful and cheap food for this purpose, either given whole or ground into flour. Barley meal, ground malt, and also coarse wheat flour, when mixed up with milk, or, what is better, water, as milk runs quickly into a state of acidity, have been much recommended in this intention. From some



experiments, we are likewise inclined to believe that pea meal employed in the same way possesses a still more fattening property, and is at the same time more economical, as going much further. A confinement of seven or eight days in this way will in general be sufficient for effecting the business of fattening. When kept up long, fowls are extremely apt to be affected with disease. Whatever sort of food is made use of, free air and a perfect state of cleanness is essential in all the utensils employed for the purpose, in order to prevent the food becoming acid, and the fowls affected with disease.

It is stated by Mr. Jackson, in the sixth volume of the "Commercial Agricultural and Manufacturer's Magazine," that he has found that "three pounds of meal, flour, or grain of such a sort as does not cost more than one penny a pound, or to the farmer and cottager not even so much, with water, and what other fare the little creature can find for itself, will feed and fatten a chicken sufficiently from the time of its bursting the shell till that of its being of a growth and in a condition suitable for its being carried to market." And that the allowance of another penny is sufficient "for the attention and labour which its rearing requires. The prime cost of the egg may be one halfpenny." Thus he conceives that even in the vicinity of any great town "a chicken that shall bring ninepence, or rather one shilling in the market, and is, in comparison with other things, worth as much for the use of your own table whether you be a rich or poor man, may be produced and reared at the expense of fourpence-halfpenny." And it is further contended, that in proportion as fowls are kept for the consumption of the portion of farinaceous food that is in daily waste about farm-houses, the expense cannot be more than one penny; consequently by attention to this economical mode we may have abundance of poultry at a reasonable rate. It is also stated that old fowls, "even though fed with food for which money proportionate to the just market value must be paid, will, by their eggs, pay annually at least three times the cost of their subsistence;" besides the advantage of the manure which they produce.

An interesting system of management for poultry is stated by Mr. Young in his *Calendar of Husbandry*, as practised by Mrs. Boys of Kent. It is simply this: "The labourers' wives and families who live on Mr. Boys's farm do the whole; he supplies them with what offal corn is necessary, and they return Mrs. Boys the grown fowls ready for market at threepence each; sixpence for turkeys and geese, and threepence for ducks; and her account, well kept, states a profit of twenty pounds a year, after all expenses are paid and the family well supplied." She has also "all the eggs without any payment." It is remarked that this system of



practice is equally beneficial to the people who undertake it as the farmer. The climate and soil are there both highly favourable to the raising of poultry.

Fowls are liable to be affected with many different diseases, but the most common ones are the following.

The *Pip*, which is distinguished by a thin white scale being seated upon the tip of the tongue; and it is supposed to be produced by the fowls' not being kept sufficiently clean, or the food and water being taken in a foul condition.

The best remedy is the removal of the scale, and the washing of the part with a weak solution of common salt in pure water.

The *Roup* is shown by the rump becoming swelled and enlarged, the feathers standing awkwardly out, and the quills being full of blood. The cure is best effected by removing the feathers, and then in slight cases using a weak saturnine wash; but where there is much swelling the part should be opened and the contents discharged.

The *Flux* is shown by the fowls' becoming suddenly thin and lean, and their not eating as usual. It is mostly caused by the use of too large a portion of moist fermenting food; or such as has run into the state of acidity. It is best removed by the giving of rice dry and wheat unground; the coop or other place in which they are confined being kept perfectly clean and well aired.

*Stoppages* are often produced in fowls by their picking up different sorts of indissoluble substances; such as old mortar, &c.: when in the crop they may be taken out by making a small opening externally.

*Blindness* in fowls is best removed by changing their food, and letting them have more fresh air.

*Galena* or *Guinea Fowl*. This is a kind of fowl that lays a great number of eggs; but probably retains too much of its wild nature to be kept with advantage by the farmer. The least disturbance makes it forsake its nest, which is mostly made in some distant unfrequented situation. The flesh of this sort of fowl is somewhat dry, but has more of the game flavour than that of the common fowl.

*Turkey*.—In grain districts, this is a bird that may perhaps be raised with advantage by the farmer; it is however very delicate and tender, requiring much attention and management while young. There are two breeds or varieties of this bird, the *black breed*, and the *white* or *speckled breed*: the former is in general the largest and most hardy.

These birds differ from others in not requiring the males to be constantly with the females during the laying season, as in Norfolk it is a practice to send the hen



turkeys to some neighbouring cock to be impregnated, one act being found sufficient for a brood. By this means there is a considerable saving, in not having cocks to keep the whole year round; and of course most little farmers raise this sort of poultry, which is supposed a principal cause of their being so plentiful in that district\*.

The turkey mostly lays from eight to ten or twelve eggs, and hatches in about twenty-eight or thirty days. The young brood are extremely tender, and require constant care and attention for a month or six weeks after they are hatched to rear them with safety. They should during this time be kept in a warm airy inclosed situation, perfectly free from wet, and be attentively fed with white bread steeped in milk that is quite free from acidity; or, what some prefer, alum curd mixed with chopped onions, for which use a proper supply of early young onions should be provided, or old ones planted in this intention. After they have been managed in this way for about a month, they may be brought gradually to be supported on oat-meal and sweet milk, or grain, of which buck-wheat is found the most suitable. As the expense in grain and trouble in the rearing of these birds is very considerable, from their being very greedy feeders, without great success in raising them, and a certainty of high prices at the market, they can seldom repay the farmer.

Young turkeys may be fattened with great expedition by means of boiled potatoes and good barley-meal mixed well together, if they be kept fed in a regular manner. The practice of cramming them is a piece of stupid and unnecessary cruelty, as it is evident they can only fatten in proportion to the quantity of food that is digested, whatever quantity may be forced upon them: besides, they will consume it fast enough without forcing, if kept regularly fed.

Mr. Kent ascribes the fineness of the flavour in the Norfolk turkeys, to the great dryness of the soil in that district, and the extensiveness of the range which they are suffered to possess.

The difference between the living and dead weight of a turkey is thus stated by Mr. Young:—Live weight 21lb.; dead weight 14lb.

*Water-Fowl.*—Various birds of this description may be kept with benefit by the farmer, where he is so situated in respect to water, commons, and other conveniences, that they can be managed without much attention or trouble; but in other cases they are not worth his notice, as they will seldom repay the trouble of looking after them.

*Ducks.*—There are different breeds of ducks, but the common *white* or *English breed* and the dark brown or speckled *wild breed* are in most estimation. The flesh

\* Marshall's Rural Economy.



of the latter is higher flavoured than the former. These birds may be kept with most profit to the farmer in situations where there are large ponds or sheets of water for them to rest upon near to the farm-yards, as in such cases they will require little or no trouble; but in other circumstances, except where they are reared by persons who make a business of dealing in these and other sorts of poultry, they will afford little advantage in the way of profit, unless it be a few just for the purpose of the table. Ducks mostly begin to lay early in the year, as the latter end of January or beginning of the following month, especially when well fed. They require attention at this period, as they lay a great number of eggs, and are very apt to drop them in the water, or at random in other places. One drake is sufficient for four or five ducks. When set, from ten to a dozen or thirteen eggs are a sufficient number. They sit about thirty days, and during the time should be fed and have water near their nests, to prevent the eggs from being injured by their leaving them too long. When hatched, they should remain with the duck in some inclosed safe warm sunny place, and be well fed with crumbs of bread, grits, or barley-meal and boiled potatoes well mixed and used fresh and fresh, sand and clean water being constantly kept in shallow pans. The duck breeders have also in general a provision of worms, snails, and other similar animals in readiness for them when a little more advanced in their growth, as well as corn either in its ground or natural state. It is likewise a point of great importance to keep them perfectly clean, and to let them have plenty of dry clean straw as litter. The practice of raising ducks under hens seldom answers well, as their habits are by no means suited to the rearing of such birds; nor has the custom of trimming off the tails of the young ducklings any better foundation in reason. They should never be admitted at full liberty till they are become quite strong, as at a month or six weeks old. It is useful to keep them as distinct as possible from the others.

Ducks are greedy feeders, but not nice in the kinds of food. In the fattening of them, grain either in its whole or reduced mixed state is probably the best sort of food. The use of boiled potatoes well mixed with oatmeal is found to be an economical and expeditious method. Much, however, depends on their being fed in an exact and regular manner, and on a proper supply of water and sand being constantly given; while at the same time they are kept in a perfectly quiet detached situation, not too much exposed to the action of light, but well aired. When fattened on animal substances, which are very expeditious in accomplishing the business, they are said to have more resemblance, both in the colour and flavour of their flesh, to the wild duck, than in the common method. In the acorn-season they are also



capable of being readily fattened on that sort of food, and are allowed to be well-flavoured in their flesh from it.

The establishing of *decoys* for taking of *wild-ducks* is an object of some importance in particular situations, as where there are extensive sheets of water in sequestered districts at no great distance from the sea, as in the wilds of Lincolnshire, Norfolk, and other counties. Much nicety and exactness are however requisite in the construction and management of these, in order to render them effectual, as may be seen in Mr. Marshall's excellent description of the means of forming them, in the first volume of the Rural Economy of Norfolk.

The author of the Middlesex Corrected Report observes, that "it is clearly ascertained, that ducks might be kept in such numbers on corn-farms, as to prevent any sensible loss or destruction in their crops by worms, slugs, and caterpillars; and yet we are always hearing of great losses occasioned by those vermin. The support of a hundred or two of ducks on a farm is a trifling expense, and might be considered in the light of ensuring the young crops against being cut off. It is thought that many a farmer receives more damage to a crop in one season, than would support a sufficient number of ducks to give perfect security for twenty years."

*Geese*.—There are several distinct breeds of geese kept in different places; but the largest and most useful sort, whether for the purpose of food or feathers, is the *common breed*.

In the choice of store-geese, great care should always be taken to procure them as large in size as possible, and from places where they have been well kept. Geese, like most other birds, begin to lay in the spring months; and the earlier this happens the better, as the price of early green geese is generally high, and in some cases it may be possible to have a second brood. Both these purposes may be promoted by letting them be well fed with oats, grains, or some such kinds of food at the period. The goose generally lays from eight to twelve eggs. It may be known when geese are about to lay, from straw being frequently picked up and carried about by them. The length of time of sitting is about thirty days. When geese are inclined to sit, they generally show it by remaining on their nest after laying a considerable time. In this case, a proper quantity of eggs, as from ten to twelve, should be placed in the nests, and something put before them, so as to prevent the geese from being much seen. They should also have plenty of food, sand and water near them, in order that they may not have to remain long off the nests, and in that way let the eggs be too much cooled. The ganders should be left with them as guards. When the weather is warm they generally hatch rather sooner than when it is cold. After the goslings are hatched,



the best method is to let them remain with the goose, especially where they are strong, in some warm sunny place, that is well secured against the entrance of rats, and all other sorts of vermin, and which is properly supplied with water; being well fed with the crumbs of bread, grits, wheat, and some chopped clivers. They should remain in this confinement until they are grown strong and capable of following the goose with ease; they may then be put into a small field, or paddock, where the grass is short, till they are fit to be turned out with the geese. When they are weakly it is customary to feed them in the house, with bread soaked in milk, or a little barley-meal, &c. Where this is done, they should however always be put under the goose again immediately after such feeding, and handled as little as possible, warmth in this stage being the most essential article in rearing them. They should never be suffered while very young to go into the water, as the cold soon destroys them.

Where the raising of these birds is an object, care must always be taken to have good ganders, which are neither too young nor too old, and that the eggs when laid be turned occasionally, and carefully kept in a dry and rather warm place. The number of geese to a gander should not be too great: three or four are quite sufficient.

The practice in Lincolnshire, where vast numbers of these birds are annually produced, is for their nests to be made for them of straw, and confined so as that the eggs cannot roll out when the geese turn them, which they do every day. When near hatching, the shell is broken a little against the beak or nib of the gosling, to give air, or to enable it to receive strength to throw off the shell at a proper time.

The time of plucking them is about the beginning of April; when the fine feathers of their breasts and backs should be gently and carefully plucked: care must be taken not to pull or interrupt their down or pen feathers.

The quills should be pulled five out of a wing. They will bear pulling in thirteen or fourteen weeks again, or twice in a year: the feathers three times a year, of the old geese and ganders, seven weeks from each pulling. The young geese may be pulled once at thirteen or fourteen weeks old, but not quilled, being hatched in March. But when late in hatching, the brood geese should not be plucked so soon as April; but the month after. When well fed with barley and oats, they thrive and do better, and their feathers grow faster and are better in quality than where it is omitted. They must constantly have plenty of grass and water\*.

\* *Annals of Agriculture*, Vol. XV.



In many parts of this fenny district vast advantage is made by the frequent plucking of the geese. At Pinchbeck it is the practice to pluck them five times in the year, as at Lady-day, Midsummer, Lammas, Michaelmas, and Martinmas. The feathers of a dead goose are worth 6d. three giving a pound. But plucking alive does not yield more than 3d. a head per annum. Some wing them only every quarter, taking ten feathers from each goose, which sell at 5s. a thousand. Plucked geese pay in feathers 1s. a head in Wildmore Fen\*.

In the fattening of *green* geese, care should be taken that a little green food be given them along with the oats or other grain that may be employed for the purpose when they are put up, and that they be well supplied with water and sand. A fortnight or three weeks is long enough for this purpose, if they be well and regularly fed; but, in the fattening of the older geese, there will not be any necessity for the green food. The place in which they are confined with this view should neither be too light, nor too public in its situation, as they do not feed so well where these points are not attended to. They should likewise be at a distance, so as to be out of the hearing of the old or store-geese.

Besides the benefits that may be derived from geese in the feathers and the birds as food, it seems not improbable but that they might be made to produce a considerable advantage in the way of manure, if managed under a system of constant littering with straw, fern, or some other substance of the same kind, as from the great quantity of grass they consume the discharge in the night is very considerable.

*Pigeons.*—Though pigeon-houses are common on many farms, it is in very few instances, probably, that this kind of stock, when the various disadvantages of it are considered, can be converted to much profit by the farmer. It is well remarked by an intelligent cultivator, that “the increase of pigeons beyond a certain degree must doubtless be injurious to the cultivation of grain: within due bounds, they do little harm; but increased beyond it, they prove pernicious vermin both to the new-sown crops and the early part of harvest. They are particularly voracious in early peas; therefore the advantage arising from their increase for consumption as food, is more than counterbalanced by the mischief occasioned by their depredations†.” And in Norfolk, pigeons are much fewer than formerly, as many of the pigeon-houses have been dropped, on account of the injury which the pigeons do to thatched buildings‡. The same is the case in Kent and other counties.

\* Young's Agricultural Report of Lincolnshire.

† Pitt's Corrected Report of Staffordshire.

‡ Ibid. of Norfolk.



They are particularly injurious to the grain crops just at the time of harvest, by settling in large flights upon the standing corn, and in this way doing more mischief by beating it down than by the quantity they consume.

Where this sort of stock is kept, warm sheltered situations, open to the south, are the most advantageous, as the pigeon delights in warmth, and being exposed to the influence of the sun.

It is also of importance in the economy of these birds, that the floor of the dove-cote be nearly upon a level with the holes where they enter, and that these holes be not too large or too numerous: the holes where they form their nests should not be much inclosed, as pigeons delight in being at liberty. Salt and strong scents, such as that of assafoetida, are said to be agreeable to these birds, so as frequently to attach them to their habitations.

The pigeon seldom lays more than two eggs at one laying, sitting about twenty days, the male and female alternately. They are capable of breeding frequently, but in general produce only two or three broods or flights in the year. There are several sorts, but the common blue pigeon is probably the most productive. The tumblers are small, but very domestic.

After recommending the harvest flight of pigeons as the most proper for the purpose of flock, as being the strongest to withstand the winter season, the author of the "Experienced Farmer" gives the following directions on the management of these birds. In regard to feeding them, it is advised as only necessary during the season between seed-time and harvest, when "it should be done by three or four o'clock in the morning; as they rise early. If you serve them much later, they will keep hovering about home, and be prevented taking their necessary exercise." If fed "the year round, they will not breed near so well as if forced to seek their own food; for they pick up in the fields what is pleasant and healthy to them, and from the beginning of the harvest to the end of seed-time they find plenty." They may be fed with tares, grain, or seeds of any kind.

"Be cautious of not letting the first flight fly to increase the flock, but let every one of them be taken; as these will come in what is called benting-time, that is, between seed-time and harvest. It is then that pigeons are the scarcest; and many of the young ones would pine to death through weakness during that season.

"At the latter end of every flight care should be taken to destroy all those eggs which were not layed in a proper time. The proper time for the spring-flight is in April and May. After the harvest-flight, cold weather begins to come on, which injures the old pigeon much if she sits late; and the young will be good for nothing if hatched."



"It is very necessary to pay attention to cleanliness in the management of a dove-cote. Before breeding-time the holes ought to be carefully examined and cleaned; for if any of the young die in the holes in summer, maggots are soon bred in them: they become putrid, and emit a disagreeable and unwholesome stench, very injurious to the inhabitants of the dove-cote. Pigeons are tenacious of their nests, as appears from the conduct of the wood-pigeon, which will breed for years in the same tree, and the mother forsakes her nest with regret; but, unable to endure the filth and stench of her dead offspring, she is obliged to quit the eggs she has laid for a second brood, and the prime of the season is lost. Every summer, immediately after the first flight, the nests should be all cleaned out, and the dung totally taken away, as it breeds filth. But remember to do this business early in the morning." The remaining eggs ought likewise to be destroyed, and a perfectly clean habitation made for the harvest-flight.

It is advised "never to go into a dove-cote later than mid-day, but as early in a morning as convenient. Whatever repairs are necessary, either to the building or to the nests, should be done before noon: for if you disturb the pigeons in the afternoon, they will not rest contentedly the whole night; and the greatest part, perhaps, will not enter the cote until the next day, but will sit moping on the ground; and, if in breeding-time, either a number of eggs may be spoiled, or several young ones starved to death."

Pigeons are supposed to be more productive from the breeds being crossed, in proof of which a few tame pigeons were put into a dove-cote; and the consequence was, that a more early and a more numerous hatch of young were produced than in any of the neighbouring cotes\*.

These birds have a great antipathy to owls, which find their way sometimes into dove-cotes; and there is no getting rid of such troublesome guests but by destroying them. "Rats are terrible enemies to pigeons, and will soon destroy a whole dove-cote. Cats, weasels, and squirrels will do the same. It will be necessary, therefore, to examine the dove-cote once every week at least, very minutely," to see that there are none of these intruders.

Pigeons "make an extraordinary good manure, which, if worked up into a compost, instead of being used in the present slovenly way, would be of still more value."

*Bees.*—How far these industrious insects may be kept as a part of the farming-stock with profit has not yet been fully shown; but as they require little trouble, and there is in most country situations a sufficiency of food ready provided for their

\* Experienced Farmer.



support, there can be little risk in the farmer making the trial, especially as the capital required will be but trifling.

In undertaking this sort of stock, the best situation is in general where the hives will be least exposed to wind, and enjoy as much of the influence of the sun as possible; for wind always retards bees in their work, while the sun's influence invites them to it. Though it is well known bees thrive well in high and windy situations, a low one is always to be preferred. Mr. Bonner advises "an early situation; a hollow glen by the side of a rivulet, surrounded with abundance of turnips in blossom in the spring, mustard and clover in the summer, and heath in the latter end of summer and harvest with a variety of other garden and wild flowers in their seasons." It is an observation as old as Columella, that the bee-garden should constantly face the south, and be placed in a warm valley near a stream.

It has been well remarked, that "a plentiful assortment of bee-flowers is a consideration that requires attention, if we design to favour an ample production of honey. The nearer the pasturage is to the apiary, the more journeys the bees can make in a day, and consequently the sooner they will be able to fill their hives. The product from a large supply, but at a small distance, and in a temperate situation, even with the common management, will be superior to that of the most skilful in a bad one. On the contrary, with bad management, and with scanty pasturage and indifferent situation, a very trifling profit can be expected. Britain in general is but thinly stocked with bees. Few farmers in comparison esteem them worth their notice; it is from the attention of cottagers we derive the chief supply of honey and wax. It will be readily admitted, that a large number of stocks kept within a small circuit, and in a bad situation, will be prejudicial to that circuit, as being more than can be supported in plenty, and will necessarily impoverish each other. The state of any particular situation may be known by the general product for several years together, and not from one or two years only; but more certainly from what a very good season will produce, which may be accounted as a standard. But there are many situations capable of feeding a much larger number of stocks than are to be found on them. However, if the generality of farmers and cottagers individually would keep a few stocks, nearly all the honey and wax this country could produce might be collected. This would not only benefit individuals, but might also be of real national utility\*."

It is added, that "large heaths and commons, surrounded with woods, are noted for being abundantly productive; the first abounding with wild thyme, and various

\* Keys on the Management of Bees.



other flowers untouched by the scythe, and the other with a profusion of farina and honey-dews. Heath and broom are very serviceable, as continuing long and late in bloom." It is remarked "that the domestic bees are very nice in their selections, and do not rove from one sort of flowers to those of another indiscriminately. They are limited to a few kinds; those of the most gaudy colours, and which afford the most resplendent show and agreeable odours, are mostly neglected by them, as hyacinths, jessamines, roses, honey-suckles, &c. while very small flowers, or those of little note, are to them plentiful sources of nectareous sweets. Sallows furnish a larger quantity of farina than most other plants, and that as early as the bees have occasion for it. Rosemary is the first aromatic plant that blows; it grows wild in some parts of France, and is the cause of that superiority for which the Narbonne honey is esteemed. Minionette yields good honey, and is valuable for its long continuance in bloom, even till November. Beds of it near an apiary will be of advantage, as will edgings of creeping lemon-thyme along the borders of the garden. Single wall-flowers in plenty will be serviceable. Lime-trees are not to be neglected about apiaries, serving in a double capacity by their flowers and their leaves, which are frequently covered with honey-dews. Neither beans nor orchard-trees afford any great quantity of honey; as may be observed by the stocks in Herefordshire, which, though abounding in orchards, is not more productive in honey than other counties. In contrast to this, the borders of Cambridgeshire and Hertfordshire, and part of Hampshire, abounding with large heaths, commons and woods, are much more productive than any other parts of the kingdom. Farmers there have been known to keep from a hundred to a hundred and fifty stocks of bees\*. But vipers' bugloss, and borage, are the two plants to be most depended upon for providing rich hives†.

In respect to stands, the best arrangement is probably that of separate ones for each hive, made by driving four strong stakes into the ground, at equal distances, as thus, : : corresponding to the dimensions of the hive floors to rest on: they should be sixteen inches above the earth, and the tops upon a level with each other; the distance three or four feet from each other, and not too many together.

In purchasing flock-bees the "best time is just before the taking-up season, which is generally about the latter end of August; for then bee-keepers reserve as many of the best stocks as they judge expedient for their next summer's supply, and therefore, after that period, are not disposed to part with any, unless at an advanced price; whereas, by purchasing some time before, a choice may be made of the best,

\* Keys on the Management of Bees.

† Ibid.



and at the accustomed rate. They should be selected by a skilful person, in a cool evening, or rather morning very early. By tapping about the hive, a pretty near guess may be formed whether or not it is full of bees, as also if full of combs. But for greater certainty, turn those that seem heavy upon the edge of the hive, and observe if the interstices between the combs are crowded with bees, and the combs worked down to the floor. If white, or of a light yellow, it denotes their being of the present year's produce, and fit for the purpose; but if they are of a very deep yellow or brown, they are of the last season, and not so proper; while those that are dingy or blackish are old, and wholly unfit to furnish a prosperous apiary. But though a hive may have the edges of the combs of a light yellow, they may be old stocks, whose combs the preceding year not having been completed, have in the present had new borders added to them of virgin wax, so as to look like young stocks. Look carefully between the combs, as far as the bees will admit; and if the interior parts appear favourable, form a judgment accordingly. The hive should be poised in the hand; and if it be about half bushel size, and weigh twenty-five pounds or upwards, it is another test of its being a good stock\*."

The "removing of stocks should take place in the evening, or very early in the morning. The hive should be raised by three or four wedges, some hours before, provided the floor is not moveable; or otherwise many bees will remain on the floor at the time, and be very troublesome. A cloth must be laid on the ground behind the hive to be removed; nimbly lift the hive thereon, and gathering the four corners tight, tie them fast on the top: immediately draw a string close round the body of the hive, to prevent any bees crawling between†." They must be conveyed in a gentle manner.

In regard to hives, straw is the best material, "as protecting the bees the most perfectly in the extremes of cold and heat, and being also generally easiest to be procured. Where it is not so, rushes, wicker-work plastered over, or sedges, may be substituted in its stead. For this use, unthrashed straw should always be employed, of all kinds of which that of rye is to be preferred, as thrashing shivers and makes it rough and shaggy, which the bees with much labour are obliged to gnaw off‡. They are made of different forms or shapes, but those in common use answer very well; they should be neatly hooded over with an upper coating of straw§.

The chief attention necessary in the management of bees is at the period of their swarming, when great care should be taken to secure them.

\* Keys on Bees.

† Ibid.

‡ Ibid.

§ Pitt's Agricultural Report of Staffordshire.



In estimating the profit of this sort of stock, it has been suggested that "one consideration should not be overlooked, viz. that almost the whole produce, arising from the sale of both honey and wax, is in a great measure clear profit; as bees and bee-hives are equally free from rents and taxes; and the culture of them does not in the least injure or impede any other improvement in any respect. Nor do they require a constant attendance, as most other articles of improvement do; for a proper person might easily oversee, with a little assistance in swarming-time, at least five hundred bee-hives. And as Nature has amply supplied them with food, and with powers to provide it for themselves, they put their owners to little or no expense for that article; which cannot be said of any other of our servants whatever\*."

It is a circumstance that deserves notice, that, by attention in the bee-master in the selection of food, almost any flavour or colour may be given to the honey, from the bright amber to a pale yellow. Mr. Paterson, of Castle-Huntley, in Scotland, found the flavour very delicate from minionette; it is the same from rosemary. Bean-honey is pale, and heath-honey brown, with much difference in flavour†. In Norfolk they commonly suppose the honey debased by the great quantity of buck-wheat that is grown; but Mr. Marshall suspects it to depend either wholly or in a great part on the heath.

*Fish-ponds.*—In particular situations, especially where the proprietor of the land keeps it under his own management, it may not only be convenient and agreeable, but likewise highly profitable, to have ponds for the breeding, rearing, and preserving of different sorts of fish. Where ponds for this use do not naturally prevail, they may in many cases be readily formed, particularly where there are very gentle falls or valleys between hills, or other depressions taking place in the grounds; and through which waters pass with a slow or very easy current. The nature of the situation will show the extent of the ponds, and the number that can be readily formed. Where water and situation admit, two, three, or more may be made on the same line or course, the head of one constituting the bottom of the other. And from one to four or five acres of ground may be covered with water, according to the supplies and other circumstances.

In such situations the only expense of forming convenient fish-ponds is that of constructing heads or banks across the valleys, or depressions, for the purpose of damming up the waters to the requisite heights, with proper sluices; which in most cases, especially where clay is at hand, may be done with but little expenditure of

\* Bonner on Bees. † Perth Agricultural Report.



money. These banks or heads should be formed on foundations of sufficient depths, as from two to three or more feet, and in breadth proportioned to the extent and pressure of the water. The wall in the middle part, which should not be less than three or four feet in width, being wholly made by *puddling* pure clay, which in many instances may be chiefly procured by sloping out the ground intended for the ponds, or digging out small ponds for *stews*, &c. If clay can be easily got from other places, it is, however, better to let the ground for the ponds remain, as the fish feed better for it. As the work of puddling advances, earth must be well rammed to the different sides of the wall, and, when finished, the whole immediately well covered over with it, in order to guard against cracking. In cases where the ground on the sides rises in a very gentle manner, banks or heads of from six to eight or nine feet in height will often be capable of covering some acres of land with water. But in the contrary circumstances they will be required to be considerably higher, as well as of greater breadth and strength. This may be easily regulated by proper levelling:—supposing ten feet to be a sufficient height in the centre for raising the water, the foot of the bank should not be less than thirty-five, being gradually narrowed or sloped on the sides so as to bring it to eight or ten on the top. It is better, however, to have the side next to the water more sloped than the other. Some such proportion as this should be preserved in all cases, always giving them too much rather than too little breadth in their foundations. Proper grates, sluices, and diverting channels for taking off the water in the time of floods will likewise be necessary; the last being formed and conducted along the sides of the ponds, where there are more than one, and the sluices fixed in the lowest parts. These should be made perfectly strong of good seasoned oak, and be well fixed in the banks, and the clay tightly rammed in about them\*.

The expense of constructing heads and banks of this nature, including every thing, may in most situations be estimated at from one to two shillings the cubical yard.

In raising carp it is often the practice to have three ponds: one for the purpose of spawning the fish in, and in which they should be left during the rest of the summer and the following winter, as they mostly spawn from the beginning of May to the latter end of July; another for the convenience of nursing up the young fry, into which they should be put about the latter end of March or the beginning of April, choosing a calm but not sunny day for the business. After which they should be carefully

\* North in *Annals of Agriculture*, Vol. XXXVIII.



prevented from coming to the sides and being destroyed. In this pond they may remain two years and become four, five, or six inches in length, and good for use; the third or main pond is destined for the reception of the grown fish, as those that measure a foot or more including the heads and tails.

The proportions in which these different ponds are advised to be stocked are these:—for each acre of the first sort, “three or four male carps, and six or eight female ones.” The most suitable sort for this use being “those of five, six, or seven years old, in good health, with full scale, and fine full eyes, and a long body without any blemish or wound.” The ponds should be previously cleared of all sorts of voracious fishes and other animals, as “perch, pike, eel, and trout; the water-beetle, and also the newts or lizards\*.” Such ponds as are warm and have an open exposure, with soft water, are the most proper for this use, all kinds of water-fowl being kept from them. For the nursing ponds a thousand or twelve hundred may not be more than sufficient for an acre; and for the main ponds, one to every square of fifteen feet is the proportion advised, as their growth depends greatly on the room and quantity of food that is allowed†. The best seasons for performing the business, in this case, are those of the spring and autumn. Some advise in these cases the stocking with carp or tench in the proportion of three to a square perch‡.

In first stocking large ponds or waters, as where they are of the extent of three or four acres, carp in the proportion of three hundred to the acre are recommended; but where they do not extend to such sizes, not so great a proportion. And in re-stocking, after two or three years, four hundred to the acre§.

Where the ponds are suitable for tench, the first stocking with them in such cases may be rather more, and in the re-stockings considerably more, as seven or eight hundred to the acre.

As perch are great breeders, in first stocking with them six hundred to the acre may be sufficient. In Berkshire, where there are many ponds for the preserving of fish, they usually stock with carp or tench in the proportion of one hundred to the acre, the fish remaining four years in them||. But in the management of Sir Harry Featherstone, in Sussex, in a pond of twenty acres reduced to sixteen by the deposition of mud, the stock is generally in the proportion of twelve hundred carp and an equal number of tench; or at the rate of seventy-five brace to the acre. And in this proportion they are said to succeed well¶. Where pike does not form any

\* North in *Annals of Agriculture*, Vol. XXXVIII.

† Ibid.

‡ *Annals of Agriculture*, Vol. XXXIX. § Ibid. || Ibid. Vol. XLI. ¶ Ibid. Vol. XXXIII.



part of the stock of ponds, care should however always be taken not to overstock, as where these sorts of fish have not an abundant supply of food, they never answer well. When taken from close-stocked ponds, a larger proportion should likewise be employed than in other cases.

The waters of some ponds are better adapted to raising some sorts of fish than others. Thus, those where the water is rich and white are more adapted for carp; while such as have a thicker appearance, and where there is a greater deposition of muddy matter, are better suited to tench. Perch are capable of being raised in almost any sort of ponds. Eels succeed best where the ponds are not very large, but where fed by a spring, and there is a large portion of rich sediment. Pike should never be kept in ponds with carp or tench, but in separate breeding-ponds, where the supplies of small fry are considerable and not wanted for stores.

Carp, tench and perch are the sorts principally cultivated with a view to profit, with a few eels occasionally. But perch and eels should not be admitted where the ponds are but thinly stocked, as they are great devourers of the young fish.

Carp and tench answer best together where the extents of the ponds are pretty large, as, in other cases, the former, from being a much more powerful fish, beats and deprives the latter of his food. Carp seldom afford much profit in ponds of less extent than half an acre; but tench thrive well in those of almost any size, being often found good in ponds of only a few perches square. Carp, perch, and eels succeed well together; and also tench and eels\*. Carp more frequently injure themselves by breeding than tench; though it sometimes happens with the latter. It is not improbable, but that in small ponds it may be the best practice to keep the carp and tench separate.

The produce or profit afforded by fish-ponds has not yet, perhaps, been sufficiently attended to in different situations to afford correct conclusions; nor is it well ascertained what is the annual increase in weight in fish of different kinds, in different periods of their growth, and under different circumstances of soil and water. Mr. Loveden states, that in Berkshire a pond of three acres and a half, drawn after being stocked three years with stores of one year old, produced

Of carp, 195 lb. weight

Of tench, 230 ditto.

—  
425 which sold for 20l. 10s, or nearly 2l. 6s. per acre per annum.

\* *Annals of Agriculture.*



And the same pond stocked with tench only, drawn three years afterwards, afforded about 26l.\*

On the supposition that in a pond which supports 2400 fish, half a pound each be added annually, it will be a 1200lb. weight, which at 6d. per pound is 30l. and for fifteen acres 40s. per acre, and at 9d. per lb. 3l. per acre†.

These are profits, though by no means great, that should draw the attention of farmers to the cultivation of this sort of stock wherever they have opportunities of making ponds with facility for the purpose, as the trouble of them is almost nothing.

And, besides, it is probable that, by more care in the stocking and other parts of their management, such ponds might be rendered much more productive. Where the ponds are supplied by streams, feeding will seldom be necessary, but in other cases it may sometimes be useful. In these instances bread composed of coarse flour and potatoes sunk in cabbage nets may be made use of. Many other substances have likewise been recommended. In severe frosts the ice should be daily broken to afford air, as without this precaution a great number of fish will frequently be destroyed in such seasons.

\* It is remarked that in this district, the price is, when sold by the pound, *one shilling* for tench and *tenpence* for the carp; which is the best mode of selling them. But when by number, they are measured from eye to tail, and sold as under:

|                                 | l. | s. | d. |                | l. | s. | d. |
|---------------------------------|----|----|----|----------------|----|----|----|
| Tench measuring under 12 inches | 3  | 0  | 0  | Carp 12 inches | 5  | 0  | 0  |
| 12 ditto                        | 5  | 10 | 0  | 14 ditto       | 6  | 10 | 0  |
| 14 ditto                        | 7  | 0  | 0  | 16 ditto       | 8  | 0  | 0  |

† Annals of Agriculture.



## ADDITIONS AND CORRECTIONS

### TO THE SECOND VOLUME.

---

*To be read after Line 25, Page 585.*—In Norfolk they never drill pease at a greater distance than nine inches. When they are dibbled they plant two rows on a flag, so that they cannot be above four inches from each other.

---

*To be read after Line 16, Page 595.*—It is the custom in Norfolk to dibble beans in the same manner as the pease, &c. except that they never set more than one hole on a flag. The plants are perhaps eight inches asunder, but are rarely buried above an inch. They turn sheep in when the beans are two or three inches high, to crop any grass which may have got up between the furrows. Sheep do not eat the beans, or in any degree injure them. With this mode of management they can grow from ten to fourteen coombs an acre. They always hand-hoe beans twice, and sometimes thrice. Where the ground is very stiff and hard, they harrow once or twice in a place before they dibble.

---

*To be read after first Line, Page 825.*—Mr. Salisbury, the present proprietor of the Brompton Botanic Garden, observes, that he sent this season, *early in May*, to the Board of Agriculture, a bundle of this grass which was in full bloom, and at the great height of *thirty-two inches*; it was sown in his ground, in September 1802, by way of experiment with other kinds: the land was far from rich, and had had no manure for several years previous to this being cut. It has been observed that the *Alopecurus pratensis* if sown alone, and cut for hay, dries in far less time than any other grass, and requires to be ricked sooner, for its quality will be injured by too long exposure. If it be mixed with other grasses, the whole will be fit for the stack the sooner.

---

*To be read after Line 3, Page 827.*—It has been remarked by Mr. Salisbury, that this grass is likely to be a scarce kind in cultivation, as the seed is not to be collected in any quantity, neither does it produce it abundantly when grown on purpose.



*To be read after Line 20, Page 827.*—According to Mr. Salisbury, this grass in certain situations is to be ranked among the best and most productive grasses; but on examining the plant in many other places where it grows spontaneously, he finds it so very small and poor, that unless circumstances were much in its favour, agriculturists should, he thinks, be careful how they hazard the sowing it; the places where it is observed to thrive best, are, he says, in low wet soils consisting of a heavy loam and clay: farmers who have lands of this description would certainly do well to select this kind for the purpose, as it is sweet, and seems to possess all that is necessary for either pasturage or hay.

---

*To be read after Line 3, Page 828.*—The same able botanist observes, that no plant whatever deserves more the attention of the farmer than this, it being of certain growth, easy culture, productive, and remarkably sweet. It will thrive in either dry or wet soils,—an advantage which most others do not possess; it appears to be little inferior to fox-tail, except in point of the early growth.

One reason why this as well as many other grasses were not formerly more generally introduced into cultivation, was the difficulty of distinguishing the grasses from each other; but which, from the study of agricultural botany, is now in some measure done away: but a greater till lately has always presented itself, which was the difficulty of procuring pure seeds of the different sorts: this too has now been in a great degree remedied by the exertions of Mr. Salisbury, who, with some country gentlemen, have laid down land sufficient to supply the principal seedsmen and others with large quantities; and it may be expected that in a short time the markets will be generally supplied with them as well as with rye-grass, which was the only one to be purchased till within these few years.

---

*To be read after Line 28, Page 828.*—Mr. Salisbury has not found the same fault in the culture of this grass as is mentioned by Mr. Curtis, which is, that it is apt to become thin and almost disappears after a while; on the contrary, he finds it stands the driest soil equal to any, gets matted together and forms a most delightful turf in very dry weather.

---

*To be read after Line 32, Page 829.*—This grass, Mr. Salisbury says, seems to chiefly affect a loamy soil, is not very productive, but, being a strong perennial, has been much recommended: it flowers about the time of the above, and is considered good



for sheep food ; and the butter made from pastures where it grows is generally esteemed excellent.

---

*To be read after Line 19, Page 835.*—Mr. Salisbury thinks this an extremely useful plant, which makes good pasturage and hay, but which thrives only in a loamy soil. It is frequently found wild in waste lands where the soil is good ; and, in fact, he considers it as a just criterion to judge of the fertility of a soil by.

---

*To be read at the end of Section XI. Page 901.*—The business of hiring and stocking farms deserves more attention than is commonly bestowed upon it. For the present purpose, it is however only necessary to place before the farmer the principal circumstances which ought to regulate his conduct, as the subject has been very fully handled by an agricultor of much practical experience\*.

The changes in regard to farming property are in general, in the more southern parts of the kingdom, made about Michaelmas. In these the farmer should deliberately consider the nature of the soil, the climate, the relative situation in respect to the convenience of improvements and markets ; the size in regard to his capital, the manner in which the inclosures are disposed with respect to each other, the management of the former tenant, the covenants by which he is to be fettered, and, finally, the amount and arrangements in regard to rent. Having made these considerations with proper minuteness and attention, weighing their advantages and disadvantages in his mind, without suffering himself to be influenced by probable causes, he may be enabled to bring their benefits into competition with their disadvantages, and to compare the former with the amount of rent which he is required to pay, in such a manner as to decide on the propriety or impropriety of his engaging them. In this matter great care should however be taken, that real inconveniences or difficulties be neither too much magnified nor too greatly despised, so as to produce a too hasty or too protracted decision ; from both of which, evils may proceed. By the latter, the securing of an advantageous farm may often be lost, while the former may lead to the engaging of one that is not by any means adapted to his circumstances. In these cases the farmer should never suffer himself to be too much influenced in his determinations by the circumstances of the preceding occupiers, as so much depends upon

---

\* Mr. A. Young.



management, that with one sort there may be considerable loss, while under another a very adequate profit may be derived.

The circumstances in respect to the nature of the soil, which have been chiefly directed to be attended to by Mr. Young, in fixing upon a farm, are these: "stiffness, moisture, exposure, levelness, slope, stoniness; what draining, manuring, fencing, &c. will be wanted: the roads, distance of market, prices of commodities, labour, &c. the state of tithes or gathering; the poor rates, the compactness of the fields, and covenants relative to cropping;" as "many such are extremely detrimental to a good conduct of the land." And "one general rule in hiring a farm should not, he says, be forgotten—to fix on good land, and he can scarcely pay too much for it; but, for poor soils, the least rent is sometimes too high to be consistent with profit. By poor soils, however, are not to be understood such as have a command of lasting manures, that work great improvements; nor waste lands, which, under that false denomination, are often found the most profitable of all."

It is observed "that the sound, mellow, rich, putrid, crumbling, sandy loams are of all soils the most profitable; such as will admit tillage soon after rain, and do not bake on hot gleams of sun coming after heavy rains, when finely harrowed: such land is better worth forty shillings an acre than many soils deserve five. The next soil is that of the stiff loam, which is nearest allied to brick earth; this, till drained, is in general an unkindly soil, without plenty of manure. It is known in winter by being very adhesive upon walking over it: is long in drying, even when little or no water is seen upon it; for which reason it is generally late in the spring before it can be ploughed. When quite dry it breaks up neither so hard and cloddy as mere clay, nor near so crumbly and mellow as the good loam. If it is in stubble, it is apt to be covered with a minute green moss. There are many varieties of this soil, but all agree in most of these circumstances; and in being what the farmers call poor, cold, hungry land. When hollow-ditched, and greatly manured, it yields any thing; but those who hire it should forget neither of these expenses."

It is added, that "the gravelly soils are numerous in their kind, and very different in their natures. Warm, dry, sound gravelly loams are easily distinguished in winter. They admit ploughing all winter through, except in very wet times; always break up in a crumbly state of running mould; and, if a stubble, will dig on trial by the spade, in the same manner. If under turnips, you may perceive, by walking through them, that it will bear their being fed off. The wet, cold, springy gravel is a very bad soil; it is known in winter by the wetness of it; and in spring, by its binding with hasty showers. It rarely breaks up in a crumbly state, or shows



a mellowness under the spade. Very expensive drains greatly correct its ill qualities, but it requires a prodigious quantity of manure to fertilise it. Some gravels are so sharp and burning, that they produce nothing except in wet summers; but such are known at any season of the year. Sands are as various as gravels, and are all easily discoverable in their natures. The rich red sand is, he believes, as profitable a soil as any in the world. It has at all seasons a dry soundness, and at the same time a moisture without wetness, which secures crops even in dry summers. The spade is sufficient to try it at any season of the year. The light sandy loam is likewise an admirable soil: it will bear ploughing, like the preceding, all winter long, and appears quite sound and mellow when tried with the spade. If it lies under a winter fallow, the best way to judge of its richness is to remark the state of the furrows, and the degree of adhesion in the soil. Stiff land, being dry and crumbly, is a great perfection, and sand, being adhesive, is an equally good sign. When, therefore, the farmer views a light sandy loam, whose sound dryness is acknowledged, he may presume the soil is rich, in proportion to its adhesion. If it falls flat in powder, and has no adhesion, it is a mere sand. The white chalky marl is often cold and wet, will not bear ploughing in winter, unless the weather is very dry or frosty; runs excessively to mortar with a heavy shower when in a pulverised state. It is a cold soil, of little profit, except with peculiar management; but answers best when dry laid down to saintfoin."

It is concluded, that "it should be laid down in general as a maxim, that strong, harsh, tenacious clay, though it will yield great crops of wheat, is yet managed at so heavy an expense, that it is usually let for more than it is worth. Much money is not often made on such land. The very contrary soil, a light, poor, dry sand, is very often in the occupation of men who have made fortunes. Some permanent manure is usually below the surface, which answers well to carry on: and sheep, the common stock of such soils, is the most profitable sort he can depend on. All stiff soils are viewed to most advantage in winter: the general fault of them is wetness, which is in the greatest excess at that season of the year. If the fields are level, and the water stands in the land, notwithstanding the furrows are well ploughed and open, it is a sign that the clay is very stiff, and of so adhesive a nature as to contain the water like a dish. It is likewise probable, that draining may prove insufficient to cure the natural evil of such land. This kind of soil likewise shows itself in the breaking up of stubbles for a fallow; a very strong draught of cattle is then necessary to work it. It breaks up in vast pieces almost as hard as iron. When it is worked fine it will run like mortar, with a heavy spring or summer shower. These soils will yield very great crops of beans and wheat, &c. They must, like others,



be cultivated by somebody; but he would advise every friend of his to have nothing to do with them; never to be captivated with seeing large crops upon the land; for he does not see at the same time the expenses at which they are raised."

It is stated that "peat, bog, moor and fen in many variations are very profitable; but the expenses of improvement demand a calculating head. The vicinity of lime or marl is then of great importance."

He says that, in respect to grass lands, the marks for judgment are different. These are best examined by attending, first, to the circumstances in which they are most deficient; and then to such as are in their favour. The more seasons grass fields are viewed in the better; though any one is sufficient for a tolerable judgment. One evil attending these lands is, that of being too wet; the signs of which can never be mistaken or overlooked in any season of the year. In winter, it is at once perceived by walking on it; at all times of the year by the herbage which generally abounds on it; such as rushes, flags, and a great quantity of moss; and also by the colour of the grass, which is mostly blue at the points, sometimes of a dirty yellow hue, and always coarse. If the soil is the first described, stiff clay, and the surface level, the evil will be very difficult of cure; if of the other sort of clay, or stiff loams, draining will have great effects. Grass fields on gravelly soils are, if the gravel is sharp, very apt to burn in dry summers: but they give great and sweet crops in wet ones, provided the land is a gravelly loam. An absolute gravel should never be under grass. A farmer should not, however, regret having a pasture or two of this sort in his farm, being of excellent use in winter for feeding sheep and lambs on with turnips, &c. The low meadows, whatever the soil, on the banks of the rivers and brooks, are in general good, but often subject to the misfortune of being overflowed in summer; which not only ruins crops of hay before they are cut, but carries them away perhaps when just made. Many grass fields, on all soils, consist of so bad an herbage as to be of little value; made up of weeds, and the worst and coarsest of grasses: if a landlord will not allow such to be ploughed, the farmer should minute the rent accordingly. This fault is visible at all seasons. A river that does not overflow, running through a farm, is a very favourable circumstance, as it indicates a probability of all the grass fields being well watered, that is, for cattle. And in many cases it may be converted to the purpose of irrigating the land.

If the climate be mild, and the lands well sheltered from the effects of the north and easterly winds by tracts of high grounds or woods of some extent, they are in many cases circumstances of a favourable kind, especially where much of the farm is to be conducted under the grazing system.



The situation of the land near towns, where the markets for the disposing of their different products are good; and in many cases near large cities, where the produce of several different sorts can not only be disposed of to much advantage, but manure in abundance be procured and brought back in return, is also a point that should not be unattended to in the taking of a farm. And if lime, marl, or other substances capable of being made use of as manures, be near at hand, they are of great importance in the management of land, and should have their due influence with the farmer in his fixing himself in a farm. Besides these, there are various other local circumstances and advantages, that may operate in different cases with propriety in directing his conduct in the business of taking a farm.

It is a matter which Mr. Young justly considers of the greatest consequence in the engaging of a farm, that no larger a one be taken "than the sum of money a man can command will stock properly. A common fault among farmers is, he says, the hiring too much land for their money: they are extremely eager to farm as much as possible; the certain consequence of which is the conducting the soil in an imperfect manner. In the neighbourhood of great cities and towns, variety of manures are to be had, in some places cheap; but if the farmers have not money, how are they to make use of such advantages? For these and other reasons, a farmer should not think of venturing on a tract of land which he cannot command, that is, farm as seems best to him."

It is obvious that a variety of advantages in the management of a farm must result from the different fields being connected, and not situated at a distance from each other: much time and trouble must constantly be saved, besides many other conveniences being attained. It has been remarked by the above writer, that "many farmers too often overlook this circumstance. If they attended to it, as much as their profit required, we should see landlords reforming their estates in this particular more than many do at present. There is not a more expensive, perplexing circumstance in a farm, than the fields being in a straggling, disjointed situation."

Where the exertions of the farmer are to be clogged with such restrictive clauses in the lease of a farm as must prevent him from cultivating it under the most advantageous method of husbandry, there is every reason for his considering the matter well before he agrees for the farm, or he may find himself injured in a much greater degree than is easily conceived. The author of the Farmer's Calendar has observed, that "the merit or reasonableness of covenants must be considered always on comparison with the nature of the farm. It is for want of this consideration that unreasonable covenants are ever proposed. These prohibitions are



foolish, but sometimes admissible: they must depend on local circumstances, to be well weighed by the farmer who hires." "The principal point here necessary to touch on, is the combination of rent, tithes and rates, in one sum. Knowing the capital intended to be invested, estimate the interest of it at not less than 10 per cent. and then calculate the expenses and produce; the former deducted from the latter leaves that sum which the farmer can afford to pay in these three species of rent. Deduct further the tithes and rates, and the remainder is what he can afford to pay to the landlord. If rent be valued in any other way, it must, he says, be erroneously and deceitfully done, and no dependence can be placed on it."

The mode of paying the rent may likewise in some instances demand the notice of the farmer in engaging a farm.

In the stocking of farms there will be considerable difference according to their nature, situation, and manner in which they are conducted; but an adequate capital should always be employed, or there will be great loss sustained. It has been observed by Mr. Young, that "thirty years ago, the sum that was usually appropriated to stocking a farm varied from 3*l.* to 5*l.* an acre; and it was a general idea, that the latter sum was sufficient for any farm, part arable and part grass, of no uncommon fertility. Rich marshes were, of course, excluded in the calculation; and light stock farms were often stocked for 3*l.* per acre. But these matters are now greatly changed; rents are much increased; tithes are compounded at a higher payment; poor rates are enormously risen; all sorts of implements, comprehended in the article wear and tear, are thirty or forty per cent. dearer; labour is in many districts doubled; the prices of cattle and sheep are greatly advanced; so that at present the same farm which at that period would have been very well stocked, and the first year's expense provided for at the rate of 5*l.* per acre, now demands from 7*l.* to 8*l.* per acre. In all such estimates it is, he says, necessary to suppose that every implement bought in is new, that the live stock be good of the sort, and that the first year's expenses be provided for, though a portion of the crop may come in before the whole payment is made. A man cannot be at his ease if he does not thus provide; nor will he be able to make that profit by his business with a small capital, which will attend the employment of a larger. By profit he would be understood to mean a percentage on his capital, which is the only satisfactory way of estimating it. If by stocking a farm with 5*l.* per acre, he makes 7 or 8 per cent. profit; and by stocking in proportion of 8*l.* per acre, he makes ten per cent. (and this difference will, he believes, often be found), it must be sufficiently apparent that the loss by the smaller



stock is a serious evil. It will depend much on situation and local circumstances: the benefit of procuring manures, or litter to make dung, may in some places be very great, in others much less: but not to be able to profit by every favourable opportunity that may attend the spot on which a farmer is fixed, must be highly disadvantageous. To irrigate land is an expensive operation; but to omit or postpone it, for want of money for the undertaking, is to lose perhaps the capital advantage of a farm. Cases of this sort might be greatly multiplied; and there is not one that does not call on the farmer for an ample capital."

The same able author justly remarks, that "of all farms, a warren is hired with the smallest capital; but that there are marshes in Lincolnshire stocked at the rate of above 30*l.* per acre. And the annual expense of many hop-grounds amounts to 30*l.* and the capital above 60*l.*"

He supposes that "if a farmer does not make ten per cent. on his capital, he must either have a bad farm or bad management, or the times must be unfavourable. He ought, he thinks, to make from twelve to fifteen per cent. Some farmers make more, when corn is at a fair price."

Besides proper attention being bestowed in these different respects, the farmer should constantly take care that the live stock be of such kinds as are best adapted to the nature and situation of the land, as, without due regard in this particular, great loss may be constantly sustained. It is never advisable for him to have recourse to the more fine or fashionable breeds, except where the nature of the soil is well suited to them, and other conveniences fully justify their introduction.

---

*To be read after Line 18, Page 836.*—The *Birds-foot Trefoil* has been found useful for cultivation in meadows which are inclined to moisture, as growing to a great height, and affording good hay. It is cultivated in Herefordshire as pasturage for sheep\*.

\* Withering's Botanical Arrangement.

---



# AN APPENDIX,

CONTAINING

## A COMPENDIOUS VIEW

OF

## THE PRINCIPAL LAWS

RELATING TO

## AGRICULTURE.

### CHAPTER I.

*Of the RELATIVE RIGHTS of LANDLORD and TENANT, including a  
concise Statement of the Doctrine respecting Leases.*

THE relation between landlord and tenant, or, technically speaking, the lessor and lessee, arises upon a contract for the possession and profits of lands or other hereditaments on the one side, and a recompence by rent\* or other consideration on the other. *Sheppard's Touchstone*, 267; 2 *Blackstone's Commentaries*, 317; 1 *Term Reports*, 598-9.

\* But there is no occasion for the rent to be, as it usually is, a sum of money; for spurs, capons, horses, corn, and other matters, may be rendered, and frequently are rendered, by way of rent. *Coke Littleton*, 142; 2 *Blackstone's Commentaries*, 142.

And it is to be observed, that if in a renewed hospital, or other lease, the reservation be of *so many quarters of corn*, this shall be understood to mean legal quarters, reckoning the bushel at eight gallons, although the old leases before the stat. 22 and 23 Car. 2, c. 12, contained the same reservation; and although in fact the tenants, or lessees, never paid in kind, but by composition, reckoning the bushel at a customary measure of nine gallons or more, for the parties having made use of the term quarters, the court must construe the lease according to the law existing, when the lease was made, and by the positive restrictions in the above act of parliament, the bushel is now to contain eight gallons, and no more, 6 *Term Reports*, 333.

A

{ To be placed at the  
end of the volume. }



And this contract may be entered into either by parol, that is by verbal, agreement, or by deed, or other instrument in writing.

It is, however, necessary to observe, that a distinction has been established between these two modes of contracting, by an act of parliament, most generally known by the name of the statute of frauds and perjuries: by which (29 Car. 2. c. 3.) it is enacted, that "all leases, estates of freehold, or terms for years, of any uncertain interests, of, in, to, or out of, any messuages, lands, tenements, &c. not put into writing, shall have the force and effect of estates at will only, and shall not, either at law, or in equity, be taken to have any greater effect: except only leases, not exceeding three years from the making, whereupon the rent reserved, shall be at least two-thirds of the improved value.

TENANT AT WILL.]—A tenant at will is one to whom another lets lands without limiting any certain or determinate estate. *Littleton, sec. 68.*

And a parol or verbal agreement to lease lands for a term exceeding three years, creates only a tenancy at will, for the statute of frauds is express that such an agreement shall only have the effect of creating a tenancy at will. *4 Term Reports, 680.*

And all leases for uncertain terms are *prima facie* leases at will: but if there be a reservation of an annual rent, that turns them into leases from year to year. *2 W. Blackstone, 117.*

Thus a parol demise for more than three years, at an annual rent, now operates as a tenancy from year to year, the meaning of the statute of frauds being, that such an agreement shall not operate as a term: and what was considered at the passing of that as a tenancy at will, has since been properly construed to endure as a tenancy from year to year. *8 Term Reports, 3.*

So a general parol or verbal demise, at an annual rent, where the bulk of the farm is enclosed, and a small part in the open common fields, is only a lease from year to year, and not for so long as the usual round of husbandry extends: in this case it was contended, that as part of the farm was open field land, and the term uncertain, it ought, for the benefit of agriculture, to be considered, according to the usual round of the husbandry of the place, to be a holding from three years to three years. But the court said, that although a *special* agreement of this kind might be very prudent and reasonable, and would be good in law, yet all the cases from king Henry VIII. (when enclosures were little known) to the present time, determine such takings, or holdings over, to be only leases for one year: that where the course of husbandry is not finished under four years, as in Berks, and other rich counties, a general parol taking cannot be construed to be a lease for four years consistently with the statute of frauds\*. *2 W. Blackstone, 117.*

And a tenancy at will, now considered as a tenancy from year to year, by the reservation of an annual rent, as above mentioned, may be created either by express words, as where one lets land to another, as long as both parties shall agree, or if a man enters and enjoys land by consent of the owner, he shall be tenant at will to him, though there be not any express lease at will, for he enters and has the land by consent. *Littleton, sec. 70; 1 Rolle's Abridgment, l. 21; Raymond, 147; 8 Term Reports, 3.*

---

\* The court said, that it might be possible, that circumstances may make it a lease for a longer term, as where the crop (such as liquorice, madder, or the like) does not come to perfection in less than two years.



Also, in the case of a tenancy from year to year, as long as both parties please, if the tenant die intestate, his administrator has the same interest in the land which his intestate had, and may bring an ejectment against the landlord. 3 *Term Reports*, 13.

And a tenancy from year to year cannot be put an end to, or determined, without reasonable notice from the one party to the other. 3 *Burrowes*, 1609.

Therefore, if the landlord brings an ejectment for lands so let at will, he must prove that *half a year's previous notice or warning was given to the tenant, or to his executor, in case of his death*, or the plaintiff will be nonsuited at the trial. 3 *Wilson*, 25.

And the six months' notice or warning to quit, cannot be given on any quarter-day; but only on that which is six months previous to the day on which the tenant first entered. 1 *Term Reports*, 159.

Neither can a tenant from year to year quit at any other quarter than that in which the year expires; and he must give six months' previous notice in like manner to the landlord, as in the last-mentioned case.

And the notice from the landlord must be positive, and not leave an option in the tenant to quit, or to hold over on certain terms; such as, "I desire you to quit at Lady-day next, unless you agree to pay double rent:" but if the words be, "*or I shall insist on double rent*," it is otherwise, and the notice is good, because the latter words are added as a threat, which may be waived, and the former leave an option to the tenant. *Douglas*, 167.

But a notice to quit is not necessary where the tenant has attorned, that is, has acknowledged himself to be tenant to a third person, in contravention of his landlord's title, or where he denies to hold as mere tenant to the landlord. *Buller's Nisi Prius*, 96.

If the landlord receives rent which becomes due *after the expiration* of the notice to quit, it is not of itself a waiver of the notice; and if an ejectment be brought to recover the lands for not quitting in pursuance of the notice, it will at the trial be left to the jury to consider with what intention the rent was received, as it may be *a waiver only of the double rent*\*, to which the landlord may be entitled, or he may have taken it under the terms, that it should not be considered as a waiver of the notice.

TENANT UNDER A LEASE IN WRITING.]—Leases exceeding the term of three years must be in writing, as before observed; but no precise form of words is essential to constitute a good lease; for whatever words are sufficient to explain the intent of the parties, that the one shall divest himself of the possession, and the other come into it, for such a determinate time, such words, whether they run in the form of a LICENCE—COVENANT—OR AGREEMENT, are of themselves sufficient, and will in construction of law amount to a lease for years, as effectually as if the most proper and per-

---

\* By the stat. 11. Geo. 2. c. 34. sec. 18. In case any tenant shall give notice of his intention to quit the premises, and shall not accordingly deliver up the possession at the time in such notice contained, the said tenant, his executors, or administrators, shall pay to the landlord *double the rent which he would otherwise have paid*; and it has been determined, that the notice by the tenant to quit under the above statute need not be in writing, but that a parol or verbal notice to quit is sufficient. 3 *Burrowes*, 1603.



tinient words had been made use of for that purpose. *Bacon's Abridgm. Tit. Leases (K)*; *Croke, Eliz.* 484; *Rolle's Abridgm.* 847; *Moor*, 459; *Noy*, 57; 2 *W. Blackstone*, 973.

But the usual words to make a lease are, according to the most approved precedents, *demise, lease, sett, and to farm let*.

And as a lessee or tenant for years may assign or grant over his whole interest, so he may grant it for any fewer or less number of years than he himself holds it; and such derivative or under lessee is compellable to pay rent, perform covenants, &c. according to the terms agreed on in such grant or agreement. *Bacon's Abr. Tit. Leases (I)* 3.

After these preliminary observations, it is necessary to shew by whom leases may be granted:

I. *A tenant in fee simple* may make leases without limitation or restraint, having an absolute and unlimited interest. *Comyn's Dig. Tit. Estates (G)* 2.

II. So *a tenant in tail* may make a lease for his own life, and by the stat. 32 *Hen.* 8, c. 28, he may make leases for three lives, or twenty-one years, to commence from the making, or some short time after, provided the lands leased have been usually letten to farm for twenty-one years past, and the accustomed yearly rent paid within that period be reserved, the intent of the statute being that the tenant in possession shall not diminish the value of the estate to the person entitled in reversion.

III. All *husbands* seised of lands in right of their wives are enabled by the same stat. 32 *Hen.* 8, c. 28, to make leases for twenty-one years, or three lives in being, to commence from the time of making the lease, observing the directions therein contained, which are the same as in respect to tenants in tail; which leases bind the wives and their heirs, so that they cannot now, after the husbands' death, avoid such leases, as they might have done before the above statute at the common law. *Bacon's Abridgm. Tit. Leases (C)*.

And if the directions in the statute are not observed, then the common law takes place, and the wives and their heirs are at liberty to avoid such leases, in the same manner as they might have done before. *Ibid.*

Also in all such leases the wife ought to be made a party.

IV. Although either a *tenant in dower*, or by the *curtesy* of England \*, may make a lease for years, reserving rent; yet if such tenant die before the expiration of the term granted, the lease is absolutely determined, and no acceptance of rent by the heir or those in reversion can make it good. *Croke Car.* 398; *Jones*, 254; *Vaughan*, 81.

V. Also *tenants for life* may grant leases of their lands for their own lives, or the life of the person on whose death the estate will determine, but no longer, unless there be a power reserved in the deed or instrument under which they are entitled, granting them liberty to demise for a longer term: and even in that case it is to be observed, that if the lease varies from the conditions, limited in the power of leasing in any respect whatsoever, either as to the interest demised, the rent reserved,

---

\* If a man takes a wife seised in fee, or in tail, by whom he has issue born alive, though such issue may die immediately, he shall hold, by the curtesy of England, the lands after the death of his wife for life. *Littleton, sec.* 35; *Coke Littleton*, 296; 8 *Coke's Reports*, 356.



or the mode of executing the power, such leases upon the death of the tenant for life are void, and cannot be supported against the heir, or those next in remainder.

If the tenant for life has no power to grant leases by the deed or other instrument under which he is entitled, it is usual to make the lease for a definite and certain number of years, *if he* (the tenant for life) *shall so long happen to live*.

VI. Also *joint tenants* and *tenants in common* may grant leases for life or years, or at will, either of the whole estate or of their several shares or moieties therein; and such leases will at the death of the one, bind the other who may survive, because it is a present disposition of an immediate interest, and binds the land from the time of the lease made. *Coke Lit.* 163; *Rolle's Abridgm.* 848; *Coke Lit.* 186.

And the reason that the lease for years of one joint tenant of his moiety, is good and binding against the survivor, is, that these joint tenants, having a reciprocal interest in each other's life, when one of them makes a lease for years of his moiety, this does not depend for its continuance on his life only, but on his life and the life of the other joint tenant, whether either of them shall live longest, according to the nature and continuance of the estate whereout it was derived; and then so long as that continues, so long the lease holds good; and by consequence such lessee shall hold out the surviving joint tenant, and the reversioner, till the estate, whereout his lease was derived, be fully determined. *Bacon's Abridgm. Tit. Leases* (I) 5.

But it is said, that if a rent were reserved on such lease, this is determined and gone by the death of the lessor, for the survivor cannot have it, because he comes in by title paramount to the lease; and the heirs of the lessor have no title to it, because they have no reversion and interest in the land. *Coke* 96; *Coke Lit.* 185, a; *Moor*, 139.

However it rather seems at this day, that the executors or administrators might maintain an action of debt or covenant, either upon the covenant in law, or express covenant, for payment of the rent, and so become answerable over to the surviving joint tenant; or perhaps a court of equity would under such circumstances interfere.

*And to obviate any such difficulty, it is advisable that the lease granted by a joint tenant, of his part or moiety, should be made to continue for a certain term of years, "if the estate and interest of the said joint tenant of or in the demised premises shall so long continue."*

Also if one joint tenant or tenant in common makes a lease for years of his part to his companion, this is good; for this only gives him a right of taking the whole profits, when before he had but a right to the moiety thereof; and he may contract with his companion for that purpose as well as he may with any stranger. *Coke Lit.* 186, a; *Croke Jac.* 83, 611; *Moor*, pl. 194; *Rolle's Abridgm.* 851; 1 *Rolle's Abridgm.* 877.

VII. Likewise *ecclesiastical persons* and *eleemosynary corporations* may, by the stat. 32 *Hen.* 8, c. 8, already noticed\*, make leases under a condition that this power is not to extend to leases of lands in farm by virtue of any old lease, unless such old lease be expired, surrendered, or ended, within one year after making of a new lease;—nor to a grant of any reversion of lands;—nor to a lease

---

\* Amended by 1 *Eliz.* c. 19; 13 *Eliz.* c. 10; 14 *Eliz.* c. 11; and 39 and 40 *Geo.* 3. c. 41.



of lands not most commonly letten by the space of twenty years before;—nor to a lease without impeachment of waste;—nor to a lease above twenty-one years, or three lives, from the day of making—and that on such lease there be reserved the most accustomably paid rent for the same within twenty years next before.

VIII. *Executors and administrators*, as they may dispose absolutely of *terms for years* vested in them in right of their testators or intestates, so may they lease the same for any fewer number of years; and the rent reserved on such leases shall be assets in their hands, and go in a course of administration. 6 *Coke*, 63, 67, b; *Bacon's Abridgm. Tit. Leases* (I) 7.

IX. But MORTGAGORS cannot in strictness grant leases of the lands which they have previously mortgaged, unless the mortgagee be made a party. Therefore a mortgagee may recover in ejectment, without giving notice to quit, against a tenant who claims under a lease from the mortgagor, granted after the mortgage, without the privity of the mortgagee. 1 *Douglas*, 21.

Also a mortgagee after giving notice of the mortgage to the tenant in possession under a lease prior to the mortgage, is entitled to the rent in arrear at the time of the notice, as well as what accrues afterwards; and he may distrain for it after such notice. 1 *Douglas*, 278.

X. Also a COPYHOLDER cannot without licence from the lord make a lease for a longer period than one year, unless warranted by the custom. *Moor*, 184. *Salk.* 186.

It is, however, said by a respectable author, that the copyholder may, by a covenant, permit the lessee to enjoy from year to year for a certain definite term, or insure the possession of the lessee for any given period. But the authority which he cites (2 *Croke*, 301) is directly the reverse; for that case lays it down, that this would be in effect a lease for the whole term intended, and a forfeiture of the copyholder's interest\*.

---

\* In the above observation it is not intended to question the judgment or learning of the author, but he certainly is too indefinite in what he has laid down; for the only mode in which the possession of the tenant of copyhold premises can be in any degree assured to him beyond the term of one year, is, by making a lease with the following form of words in the habendum: "To HAVE AND TO HOLD  
"all and singular the said demised premises, and every part and parcel thereof, with their and every  
"of their appurtenances, unto the said A B, his executors, administrators, and assigns, from ———  
"unto the full end and term of one whole year, and so from year to year until the expiration of the  
"term of ——— years, from the said ——— day of ———, if the lords, lady, or ladies of the  
"manor or manors whereof the same demised premises are holden, shall consent thereunto, and if, according  
"to the custom or customs of the said manor or manors, the same may be so demised without prejudice or  
"forfeiture, but not otherwise, YIELDING AND PAYING," &c. as in other leases, observing to let the  
covenants run in the following words, viz. *During the continuance of the said term from year to year as aforesaid.*



## CHAP. II.

*FORMS of LEASES, with Notes illustrative of the Operation and Effect of the Covenants.**I. The Lease of a Farm for Twenty-one Years, with Covenants directing the Course of Husbandry, according to the Western Practice.*

THIS Indenture, made the ——— day of ———, in the ——— year of the reign of our sovereign Lord George the Third, by the grace of God of the united kingdom of Great Britain and Ireland, king, defender of the faith, and so forth, and in the year of our Lord God, 1803, between Andrew Atkins, of ———, of the one part, and Bartholomew Bell, of ———, of the other part, witnesseth, that in consideration of the yearly rent, covenants, conditions, and agreements hereinafter contained, and on the part of the said Bartholomew Bell, his executors, administrators, and assigns, to be paid, done, kept, and performed, the said Andrew Atkins HATH demised, leased, sett, and to farm let, and by these presents DOth demise, lease, sett, and to farm let, unto the said Bartholomew Bell, his executors, administrators, and assigns, all that messuage, tenement, and farm, with the appurtenances, commonly called or known by the name of ———, situate, lying, and being within the parish of ———, in the said county of ———, now in the tenure or occupation of the said Bartholomew Bell, as tenant to the said Andrew Atkins, together with all houses, out-houses, edifices, buildings, barns, stables, courts, curtilages, gardens, orchards, lands, meadows, pastures, feedings, ways, paths, waters, water-courses, easements, profits, commodities, emoluments, and appurtenances whatsoever to the said messuage, tenement, and farm, or any part thereof, belonging or in any wise appertaining (except\* and always reserved out of this present demise unto the said Andrew Atkins, his heirs and assigns, all quarries and mines whatsoever, open or unopened, and all and all manner of timber trees and young trees and saplings likely to become timber, of what nature or kind soever, now standing, growing, or being, or which hereafter shall stand, grow, or be, in or upon the said demised premises or any part thereof, with full and free liberty to and for the said Andrew Atkins, his heirs and assigns†, and his and their servants,

---

\* The landlord cannot enter in order to work mines, fell timber, or the like, without an express covenant allowing him to do so; for *particular* advantages belonging to some lessors only, and not to all (such as the right to enter to see the state of repairs), must be provided for by particular agreement. *Coke Lit.* 54.

† If the lessor or landlord holds only intermediately under a superior lease from another, any reservation or exception as to part of the premises demised, and all the covenants where his name is mentioned, must run in the words *his executors, administrators, and assigns*, instead of "his



agents, and workmen, to enter into and upon, and pass and repass at all seasonable times in the day time, upon, over, and through the said demised premises for the felling, rooting up, and working and planting such trees and saplings, and opening, ripping, digging, and drawing the stones and minerals in such mines and quarries, and taking and carrying away the same with any manner of carriages whatsoever at the free will and pleasure of the said Andrew Atkins, his heirs or assigns, doing no wilful waste or spoil), to have and to hold the said messuage, tenement, and farm, and all and singular the premises hereby demised or mentioned and intended so to be, with their and every of their appurtenances (except as before excepted), unto the said Bartholomew Bell, his executors, administrators, and assigns, from the ——— day of ——— now next ensuing, for and during and unto the full end, term, and time of twenty-one years from thence next ensuing, and fully to be complete and ended; yielding and paying therefore yearly and every year during the said term hereby demised unto the said Andrew Atkins, his heirs or assigns, the rent or sum of ——— pounds, of lawful money of Great Britain, by even and equal half-yearly payments in each and every year, at or upon the two most usual feasts or days of payment of rent hereinafter mentioned (that is to say), the ——— day of ——— and the ——— day of ——— in each and every year, the first of the said half-yearly payments to be made on the ——— day of ——— now next ensuing. PROVIDED ALWAYS, and it is hereby declared and agreed by and between the parties to these presents, that if it shall happen that the said yearly rent or sum of ——— pounds, or any half-yearly payment of the same, shall be behind and unpaid in the whole or in part by the space of twenty-one days next after either of the said feasts or days of payment whereon the same ought to be paid as aforesaid, *and the same shall be demanded on the expiration of the said twenty-one days or at any time afterwards\**, and not paid at the time of such demand, that then and from thenceforth it shall and may be lawful to and for the said Andrew Atkins, his heirs and assigns, into and upon all and singular the demised premises with the appurtenances, or into and upon any part thereof, in the name of the whole, to re-enter and the same to have again, re-possess, occupy, and enjoy, as if these presents had not been made, these presents or any thing in them contained to the contrary thereof in any wise notwithstanding. AND the said Bartholomew Bell doth hereby for himself, his heirs, executors, administrators, and assigns, covenant, promise, and agree, to and with the said Andrew Atkins, his heirs and assigns, that he the said Bartholomew Bell, his executors, administrators, or assigns, shall and will from time to time well and truly pay, or cause to be paid, unto

---

heirs and assigns," which latter words are only to be used where the lessor or landlord is entitled to the fee simple and freehold, and not to a smaller estate carved out of the inheritance, such as a leasehold or term for years is.

\* In consequence of the decision in *Doe v. Windlass*, 7 Term Rep. 117, in which it was determined, that under a power of re-entry in case of non-payment of rent, the landlord cannot recover in ejectment at common law, unless he prove a demand on the very day on which the rent became due; nor under the statute of 4 Geo. II. c. 28, unless he prove that there was not a sufficient distress on the premises; it has been considered by conveyancers as advisable to introduce in the clause empowering the lessor or landlord to re-enter, the above words distinguished by *Italics*.



the said Andrew Atkins, his heirs or assigns, the said yearly rent or sum of ——— pounds, at the days and times and in manner and form herein before limited and appointed for payment of the same, according to the reservation hereby made thereof, and the true intent and meaning of these presents. AND ALSO, that he the said Bartholomew Bell, his executors, administrators, and assigns, shall and will carry into and upon every acre of the said hereby demised premises which he or they shall till or break up for tillage, and in that proportion for every less quantity than an acre, except upon four closes of land, parcel of the said hereby demised premises, called or known by the names of A, B, C, and D, ——— dozen bushels of good and well-burnt stone lime, and there lay, mix with the earth and soil, spread, cast abroad, and manure or dress every such acre, and so in proportion, according to good husbandry; and that he the said Bartholomew Bell, his executors, administrators, and assigns, shall and will carry into and upon every acre of the said four closes of land, called A, B, C, and D, that he or they shall till or break up to or for tillage, and in that proportion for every less quantity of the same closes than an acre, ——— bushels of good and well-burnt stone lime, and there lay, mix with earth and soil, spread, cast abroad, and manure or dress every such acre, and so in proportion, according to good husbandry; and that he the said Bartholomew Bell, his executors, administrators, or assigns, upon or after such manuring or dressing, shall and will have and take three crops and no more of any kind of corn or grain, and those successively one year after another, without the intermission of any year; and that only one of such crops, and that not the last, shall be of wheat, and the other of barley or oats, or one of the one sort and the other of the other sort, and shall not nor will break up or till any part of the said premises for more than two courses of tillage (computing three crops of corn and grain to a course of tillage) during the said term. AND ALSO, that he the said Bartholomew Bell, his executors, administrators, or assigns, shall or will, with the seeds of corn or grain to be sown in the Lent season of the last year, before the end of the said term hereby demised, sow, or cause to be sown, at least six pounds of good new clover, and two pecks of the best new grass seeds, on each and every acre, and harrow, brush in, and cover the same clover and grass seeds according to the course of accustomed usual and good husbandry: and that he the said Bartholomew Bell, his executors, administrators, or assigns, shall not, nor will permit or suffer the grass which shall arise or grow from such clover and grass seeds to be eaten or trodden down after Christmas-day in the last year of the said term, nor to be eaten too close or otherwise injured contrary to the accustomed and usual rules of good husbandry, at any time after the seeds shall be sown. And also shall not, nor will have or take more than one crop of potatoes in one field in any seven years during the said term hereby granted. And also, that it shall and may be lawful to and for the said Andrew Atkins, his heirs or assigns, at any time after the first day of August next preceding the end or determination of the said term, at his and their own election, to enter into and upon and thwart over, break up, and plough any one field not exceeding ——— acres of ground, part of the said demised premises, and to make breaches and fallow for wheat, and to till the ground so thwarted, eared, broken up, and ploughed, and to hold the same from and after the thwarting, earing, breaking up, and ploughing thereof, from thenceforth, for and during all the rest and residue of the said term, without making any deduction, allowance, or recompence, in respect thereof. And also, that he the said Bartholomew Bell, his executors, administrators, or assigns, shall not nor will cut or mow, or suffer to be cut or mown, any



of the grafs arising from the clover or other grafs seeds which shall be sown in any part of the said demised premises oftener or more than once, and only in the next ensuing season of the year for that purpose, after the ground sown with such clover or other grafs seeds shall be left out of tillage. And also shall not, nor will cut or mow, or suffer to be cut or mown, the grafs of any part of the said premises, except the meadow ground, and such ground as is or shall be sown with grafs seeds as aforesaid; nor till or break up for tillage any part of the meadow ground during the said term; nor cut or mow the grafs of the same oftener than once in any year during the said term. And that he the said Bartholomew Bell, his executors, administrators, and assigns, shall not nor will cut any hedge or hedges of or belonging to the said hereby demised premises but in the proper season of the year for that purpose, and not under seven years' growth, and such hedges as adjoin to arable ground only when the ground adjoining thereto on one side at least shall be in tillage for the first crop after a new breach, and shall and will at the time leave sufficient growth in the hedges to cut, and upon and immediately after such cutting shall and will cast, load, slope down, and new-make the hedges so cut on both sides, according to accustomed usual and good husbandry. And also shall and will from time to time and at all times during the said term, well and sufficiently repair, amend, and in good tenantable condition put, maintain, and keep all the hedges and the glass of the windows, and also the gates, bars, stiles, and posts of or belonging to the said demised premises, having timber requisite and necessary for that purpose by the assignment or delivery of the said Andrew Atkins, his heirs or assigns, and at the end, expiration, or other sooner determination of the said term, the said hedges, glass of the windows, gates, stiles, bars, and posts in good and sufficient repair, shall and will leave and yield up (reasonable use and wearing thereof in the mean time always allowed). And also shall not nor will cut, top, or lop any tree or trees on the said premises hereby demised, but such trees as have been topped, and those only in the proper season of the year for that purpose, and not in an improper manner, nor under seven years' growth, nor do, or permit and suffer to be done, any waste, spoil, or destruction in or upon the said demised premises or any part thereof during the said term, nor demise, lease, set, let, or part with the possession of the said premises for any longer term than one year, and that to pasture only, without the previous consent and authority of the said Andrew Atkins, his heirs or assigns, for that purpose first had and obtained in writing. And also, that he the said Bartholomew Bell, his executors, administrators or assigns, shall not nor will carry off from the said premises any muck, dung, soil, ashes, compost, or other manure, or any hay, straw, or corn in the straw, which shall arise, be made, grow, or be produced thereon during the said term; but on the contrary shall and will yearly, and every year, during the said term hereby demised, at the most seasonable times, and according to the due and accustomed course of husbandry, lay and spread on some part or parts of the land hereby demised and where most necessary, all such muck, dung, soil, ashes, compost, or other manure as shall from time to time arise, be made, or produced upon the said demised premises or any part thereof; and also shall and will yearly, and every year, during this demise, fodder out, spend, and consume into dung with neat beasts and other cattle in an husbandlike manner, on some part or parts of the premises hereby demised, where most convenient or necessary, all the hay, straw, chaff, fodder, and clover that shall during the said term hereby demised from time to time arise, grow, or be produced upon or from the said demised premises or any part or parts thereof. AND



ALSO, that he the said Bartholomew Bell, his executors, administrators, or assigns, shall and will, during the said term hereby demised, well and truly pay, discharge, and satisfy, or cause to be paid, discharged, and satisfied, the great and small tythes, and the house, window, and all other taxes and assessments whatsoever, whether parliamentary or parochial, the land tax only excepted, and do and perform or cause to be done and performed the statute labour on the highways, or pay the composition money for the same, which shall become due or payable in respect thereof, to be done and performed. AND ALSO that he the said Bartholomew Bell, his executors, administrators, or assigns, shall and will live and reside in the dwelling-house part of the said demised premises during the said term hereby granted. AND he the said Andrew Atkins doth hereby for himself, his heirs, and assigns, covenant, promise, and agree to and with the said Bartholomew Bell, his executors, administrators and assigns, in manner following, (that is to say) that he the said Andrew Atkins, his heirs and assigns, shall and will pay and discharge, or otherwise deduct and allow out of the rent hereby reserved, the land tax, which shall be paid by the said Bartholomew Bell, his executors, administrators, or assigns, for or in respect of the said demised premises, during the said term hereby demised; and also shall and will sufficiently repair, amend, and in good tenantable condition maintain and keep, the said messuage or tenement, out-houses, and buildings in the main and principal walls, and the roofs and tiling of the same and every of them, in all needful and necessary reparations whatsoever, when and as often as need or occasion shall require during the said term of twenty-one years; and he and they shall be thereunto requested by the said Bartholomew Bell, his executors, administrators, or assigns, by ——— months previous notice or warning in writing for that purpose, under his or their hand or hands: and also shall and will find and provide good and sufficient timber for repairing the gates, bars, stiles, and posts, belonging to the said demised premises; AND FURTHER, that it shall and may be lawful to and for the said Bartholomew Bell, his executors, administrators, and assigns (well and truly paying the rent hereby reserved, and observing, fulfilling, performing, and keeping all and every the covenants, conditions, and agreements herein contained on his and their parts and behalves to be observed, fulfilled, performed, and kept), from time to time and at all times hereafter during the said term hereby demised, peaceably and quietly to have, hold, use, occupy, possess, and enjoy all and singular the said demised premises with the appurtenances (except as before excepted), without the let, suit, trouble, molestation, denial, or eviction of him the said Andrew Atkins, his heirs or assigns, or any person or persons lawfully claiming or to claim the said premises or any part thereof, by, from, or under him, or them, or any of them, and without the let, suit, trouble, molestation, disturbance, denial, or eviction of any other person or persons whomsoever\*. In witness, &c.

---

\* By 11 Geo. II. c. 19, §. 12, where an ejectment is served on any lands, if the tenant does not give notice to the person of whom he holds, of the service of such ejectment, he shall forfeit three years' rent of the premises, to be recovered by action of debt.



*Form of a Lease of a Farm in the Midland District for Twenty-one Years, commencing as to several Parts at different Periods, and subject to Rents and Reservations.*

THIS Indenture made, &c. between Andrew Atkins, of ———, esq. of the one part, and Bartholomew Bell, of ———, yeoman, of other part, witnesseth, that the said Andrew Atkins, for and in consideration of the rents, duties, services, covenants, and agreements hereinafter reserved and contained on the part of the said Bartholomew Bell, to be paid, done, observed and performed, HATH demised, leased, set, and to farm let, and by these presents BOTH demise, lease, set, and to farm let, unto the said Bartholomew Bell, all that messuage, tenement, and farm, commonly called or known by the name of ———, situate, lying, and being in the parish of ——— [or the several parishes of ———], in the county of ———, and within and parcel of the manor of ———, in the said county of ———, and lately in the tenure of ———, and now or late of the said ———, together with all and singular the rights, members, privileges, and appurtenances to the said premises or any part thereof belonging or appertaining (excepting and always reserved out of this present demise unto the said Andrew Atkins, his heirs and assigns, all woods, underwoods, timber, and other trees and saplings of what kind or nature soever, now growing or being, or which hereafter shall grow or be in or upon the said demised premises or any part thereof; and all mines, veins and beds of coal, lead, copper, and other metals or minerals, and all quarries of lime or other stone, now being or which shall hereafter be found or discovered in or upon the said demised premises or any part thereof, with full liberty and power to and for the said Andrew Atkins, his heirs and assigns, and his and their agents, servants, workmen, chapmen, and dealers, and every other person that shall be authorised for that purpose, at any time or times hereafter, to enter into or upon the said demised premises or any part thereof, and there to fell, cut down, work up, cord, stack, burn, coal, or otherwise convert, the said wood and underwood, trees and saplings, or any part thereof, and also to dig, delve, search for, get up, dress, and make merchantable and fit for sale, the said coal, stones, metals, and minerals, or any part thereof; and the said excepted premises, or any part thereof, to take and carry away with all or any sort or manner of carriages, and for the several and respective purposes aforesaid, to make and erect all or any kind of warehouses, engines, machines, sawpits, coal-hearths, and other conveniences, on the said demised premises or any part thereof, at his and their free will and pleasure; and also except and reserved unto the said Andrew Atkins, his heirs, and assigns, full liberty and power to and for him and them, and his and their agents, servants, and workmen, at any time or times hereafter to dig, raise, and carry away, marl, clay, gravel, and sand, in and from the said demised premises or any part thereof, for the manuring of other his or their lands, the making of roads, bricks, or tiles, or other purposes (in case there shall be more than shall be wanted thereon); and plant any part or parts of the said demised premises with all or any kind of forest-trees, and the same from thenceforth to preserve; and also to make any road or roads, piece or pieces of water and water-courses, and the same from time to time to alter and divert, and to take from the said Bartholomew Bell, his executors, administrators, and assigns, and convey in exchange for other lands or tene-



ments, or sell any part or parts of the said premises hereby demised; and likewise to plough and fallow at or after Christmas-day next before the determination of this demise, any part or parts of the said demised premises, and to take and have convenient stabling and tyings in the out-buildings on the said demised premises for the horses and cattle which shall be employed in and about the same, making to the said Bartholomew Bell, his executors, administrators, and assigns, on the exercise of all or any of the liberties and privileges herein before excepted, such satisfaction and recompence for the damage he or they shall sustain thereby, as two indifferent persons (whereof the one to be chosen by the said Andrew Atkins, his heirs, or assigns, and the other by the said Bartholomew Bell, his executors, administrators, or assigns) shall think reasonable; and likewise except and reserved unto the said Andrew Atkins, his heirs, and assigns, full liberty and power to and for him and them, and his or their agents, servants, and workmen, to sow with clover and grass seeds such part and parts of the said demised premises as shall be in tillage the spring seed-time next before the determination of this demise, and upon or after the first day of \_\_\_\_\_ next following such seed-time, to take possession of the same lands, and fence and preserve the same and the clover and grass therein thenceforth, to and for his and their own use and benefit; and also upon every fall which shall be made on the wood or coppice lands of or on the said demised premises, to fence and cople up the same, to preserve the future sprigs therein from the bite of sheep and cattle and all other trespasss and damage during the space of \_\_\_\_\_ years, next after each fall respectively: and also except and reserved unto the said Andrew Atkins, his heirs, and assigns, all game, wild fowl, and fish, which now are or hereafter shall be in or upon the said demised premises, or any part thereof, with the sole liberty, privilege, and power of hunting, coursing, hawking, setting, fowling, and fishing for the same by himself or themselves, and his or their companions, and by his or their gamekeepers, with servants, horses, and dogs, in and upon the said demised premises, or any part thereof; and the game, fowl, and fish there killed or taken, to have and carry away to and for his and their own use and benefit, at his and their free will and pleasure); to have and to hold the said messuage, tenement, farm, and other the premises (except as herein before excepted), unto the said Bartholomew Bell, his executors, administrators, and assigns, in manner following (that is to say), the part or parts thereof which is or are meadow land, from the \_\_\_\_\_ day of \_\_\_\_\_ last past, the dwelling-house and necessary out-buildings, from the \_\_\_\_\_ day of \_\_\_\_\_ next coming, and the residue of the premises from the day of the date hereof, for and during the full and whole end term and time of \_\_\_\_\_ years thence respectively next ensuing, and fully to be complete and ended: and to hold such field, if not less than \_\_\_\_\_ acres, part of the said demised premises as shall be hereafter appointed by the said Andrew Atkins, his heirs or assigns, or his or their agent for the time being, as a \_\_\_\_\_ pasture unto the said Bartholomew Bell, his executors, administrators, and assigns, from the end or sooner determination of the said term therein until the \_\_\_\_\_ day of \_\_\_\_\_ then next following: yielding\*, paying, rendering, and performing therefore yearly, and in each and every year during the continuance of this demise, unto and for the said Andrew Atkins, his heirs and assigns, the several rents, duties, and services hereinafter mentioned, viz. the rent or sum of \_\_\_\_\_ pounds, of lawful money of

---

\* Several annual rents may, by apt words, be reserved in the same demise. 5 Coke, 55 a.



Great Britain, free and clear of and from all taxes and deductions whatsoever (except land-tax), by two equal half-yearly payments, at or upon every ——— day of ———, and ——— day of ———, in each and every year (the first payment to be made on the ——— day of ——— next), and two strikes or bushels of oats, and one couple of fat fowls, on every ——— day of ———; and also two days' work or labour with a waggon and four horses, attended by or with a waggoner at such time or times in the year as shall from time to time be appointed; and likewise the keep of a dog and a cock, if required; and grinding all the corn and grain which shall be eat or consumed in or upon the said demised premises or any part thereof, during the continuance of this demise, at the mill of the said Andrew Atkins, his heirs or assigns, called ——— mill, in the parish of ——— aforesaid, he and they being well used and in convenient time dispatched; and doing and performing suit and service at all and every the courts to be holden or kept for the manor or borough of ——— aforesaid, and abiding by and obeying all and every the orders and by-laws which shall be there made and ordained; and also yielding and paying for every acre of meadow or usual mowing ground of the said demised premises, which he the said Bartholomew Bell, his executors, administrators, or assigns, shall plough or break up for tillage, and for every of the premises hereby demised exceeding ——— acres, which he or they shall have in tillage in any one year of this demise, and also for every acre thereof exceeding ——— acres, which he or they shall mow in any one of the last four years of this demise; and likewise for every acre thereof exceeding ——— acres, which he or they shall sow with flax or hemp seed, and for each and every of them, severally and respectively, the rent or sum of ——— pounds, of like lawful money, over and above the said rents, duties, and services herein before reserved, and in that proportion for more or less than an acre at or upon every said ——— day of ———, and ——— day of ———, the first payment thereof respectively to be made on such of the said days as shall first happen after the committing or doing of the acts or deeds for which the same is or are hereby respectively reserved as aforesaid, and to continue payable and be paid thenceforth during the continuance of this demise. And likewise yielding unto the said Andrew Atkins, his heirs, and assigns, for every timber or other tree or sapling which he the said Bartholomew Bell, his executors, administrators, or assigns, shall cut down, top, or lop, without the licence of the said Andrew Atkins, his heirs or assigns, or his or their agent for the time being, the sum of ——— pounds, of like lawful money; AND the said Bartholomew Bell, for himself, his heirs, executors, administrators, and assigns, doth hereby covenant, promise, and agree, to and with the said Andrew Atkins, his heirs and assigns, in manner and form following, (that is to say) that he said Bartholomew Bell, his executors, administrators, and assigns, shall and will well and truly pay\*, render, and perform, or cause to be paid, rendered, and performed, unto and for the said Andrew Atkins, his heirs and assigns, the aforesaid yearly rents of ——— pounds, two strikes or bushels of oats, one couple of fowls, two days' labour with a waggon, a waggoner, and

---

\* Where the lessee covenants generally to pay rent, though he has had no enjoyment of the premises, *as where they are burned down*, and there is a covenant to repair in all cases except that of fire, yet shall the tenant be liable for all growing arrears of rent under this covenant. 1 *Term Reports*, 310.



four horses, and the keep of a dog and a cock, and also the said several other yearly and other rents or sums of money herein before reserved (if the same shall respectively become payable), on the days and in the proportions herein before limited and appointed for payment thereof respectively; and shall and will pay, bear, and discharge, all taxes, rents, assessments, and impositions whatsoever (except the land-tax\*), which shall be charged on, or become payable for or in respect of the said demised premises, or any part or parcel thereof, from time to time, or at any time or times during the continuance of this demise: and also shall and will, at his and their own proper costs and charges, well and sufficiently repair†, scour, cleanse, amend, maintain, keep, and preserve the said messuage, tenement, and other the premises hereby demised, and all the houses, edifices, walls, buildings, hedges, ditches, mounds, gates, bars, stiles, pales, rails, fences, foughs, drains, gutters, and water-courses, which now is or are, or at any time during the continuance of this demise, shall be in or upon the said demised premises, or any part thereof, in, by, and with all needful and necessary repairs, scourings, cleansings, and amendments whatsoever, where, when, and as often as need shall be or occasion require (accidents by fire only excepted): and at the end or other sooner determination of this demise, all and singular the same premises and every part and parcel thereof so respectively well and sufficiently repaired, cleansed, amended, kept, and preserved, shall and will leave and yield up, unto the said Andrew Atkins, his heirs, or assigns, he the said Bartholomew Bell, his executors, administrators, and assigns, having for and towards the doing such repairs, necessary and convenient rough timber on the stem on the said demised premises, or within two miles thereof, by the appointment of the said Andrew Atkins, his heirs, or assigns, or his or their agent for the time being, and not otherwise: AND FURTHER, that the said Andrew Atkins, his heirs, or assigns, and his or their agent for the time being, with artificers and workmen, shall and may, in the day time, at any time or times during this demise, enter into and upon the said demised premises or any part thereof, and view, search, examine into, and see the state and condition of the same ‡, and

\* The lessee has a right in all cases to stop the land-tax out of the rent to his landlord, unless there is an express agreement that he shall not. *Sayer's Reports*, 78.

And an exception as to the land-tax, only extends to that sum which was payable at the time of the execution of the lease; and if the tenant by improvements, such as new buildings or the like, occasions an increase in the future assessments, the landlord is not liable to deduct out of his rent more than the amount of the original charge at the time the lease was granted. 3 *Term Reports*, 377.

† Under this covenant *the ordinary and natural decay* is no breach thereof. *Fitzherbert's Abr. Tit. Cov. f. 4.*

And if the lessee *pulls down houses or suffers them to decay*, no action will lie against him till the end of the term; for before that time he may repair them. *Fitzherbert, N. B.* 342.

But if he cuts down timber or trees, covenant lies immediately; for such cannot be replaced in the same plight at the end of the term. *Ibid.*

‡ A lessor may enter upon the premises of his lessee to see the state of the repairs, though there



leave notice in writing thereon of such defects or want of reparation, scouring, cleansing, or amendment, as shall be then and there found : and in case the said Bartholomew Bell, his executors, administrators, or assigns, shall not well and sufficiently repair and amend the same within three calendar months next after such notice, that then he the said Andrew Atkins, his heirs, or assigns, or his or their agent for the time being, with artificers and workmen, shall and may enter into and upon the said demised premises, and do, rectify, and complete such reparations and defects, and charge the costs and expences thereof unto and upon the said Bartholomew Bell, his executors, administrators, and assigns, as an additional rent for the said demised premises for the year in which he or they shall neglect to do such repairs, and upon non-payment thereof, he the said Andrew Atkins, his heirs, or assigns, or his or their agent for the time being, shall and may levy and recover the same by distress and sale of the goods and chattels to be found on the said demised premises or any part thereof, in such ample manner and form, and as fully and effectually as he or they may levy the said original or proper rent hereby reserved, or either of them, in case the same shall be in arrear ; AND LIKEWISE, that he the said Bartholomew Bell, his executors, administrators, and assigns, from time to time, and at all times during the continuance of this demise, shall and will plant quick in the dead or decayed part of the hedges of the said demised premises, and use his and their best endeavours to preserve and keep from bite of cattle, and other destruction, spoil, and damage, as well the said quick, as all and every the woods, underwood, timber, and other trees and saplings, which now are or hereafter shall be planted or growing on the said demised premises, or any part thereof ; and shall not nor will cut or break down, root up, top, lop, or injure any or either of them, except taking timber for repairs, by appointment as aforesaid, and also taking, by like appointment (and not otherwise) from such of the said trees as are pollards, reasonable wood for summer fuel in the dairy only, and for ploughbote, cartbote, and hedgebote, off and on the said demised premises ; and shall and will constantly inhabit, or cause to be inhabited by a fit and proper family, the dwelling-house, and occupy, manage, manure, and improve, in a good, proper, and husbandlike manner, the lands and premises hereby demised, and not burn, bat, run out, or otherwise beggar or impoverish, nor commit or suffer any waste, spoil, or destruction on the same, or any part thereof \* : and also shall and will thresh and clean on the said demised premises, all the corn and grain which shall be grown thereon, and eat and consume thereon all the hay, straw, fodder, and fuel, which shall be produced on the same or any part thereof ; and likewise shall and will yearly, and every year, during the

---

be no covenant for that purpose, such liberty being allowed by law for the general benefit of the lessor's estate. *Coke Lit.* 54.

\* Although a tenant does not hold under any lease, the mere relation of landlord and tenant will raise an implied promise on the part of the tenant to cultivate the land in a good and husbandlike manner. 5 *Term Reports*, 373.

And under a general covenant to use the premises during the term in a careful, proper, and husbandlike manner, the tenant must expend all the manure made upon the land, upon the demised premises ; but is not obliged to bring back manure produced by straw and the like, carried away at the end of his term. *Reports*, 279.



continuance of this demise, at seasonable times, and in an husbandlike manner, spend, use, spread and bestow, in and upon fit and proper parts of the said demised premises, four wagon-loads of good stone lime, and all the muck, dung, compost, and manure which shall be made, produced, or raised on the said demised premises, or any part thereof; and shall not nor will break up or sow with corn or grain, any more or other part or parts of the lands hereby demised, than he or they shall at any time well and sufficiently manure, nor take more than three crops therefrom under any one tillage, for one of which crops he or they shall and will make a summer fallow, or have a fallow sown with turnips on the same ground, or break up a clover-lay of the first or second year's growth, and well manure the same, and with the last of such crops lay down the land so tilled therewith, well sown with a proper quantity of good clover and rye-grass seeds; and shall and will at the end, or other sooner determination of this demise, leave on the said demised premises, to and for the use and benefit of the said Andrew Atkins, his heirs or assigns, one half part of all corn and grain whereof the seed shall have been tilled or sown thereon at the then last seedness \* in any brush or stubble, and one-third part of all corn and grain whereof the seed shall have been sown thereon, at the then last seedness, in a fallow or a clover-lay of the first or second year's growth, well manured; and also all the muck, dung, compost, and manure which shall be made, produced, or raised on the said demised premises, or any part thereof, during the then last twelve months, without having or claiming any allowance or satisfaction for the same. And also shall and will permit and suffer the said Andrew Atkins, his heirs and assigns, to have, exercise, and enjoy all and every the liberties, privileges, matters and things herein before excepted out of this demise, without any let or molestation, and shall not nor will assign, set or let, or yield and deliver up the possession of the said demised premises, or any part thereof, to any person or persons whomsoever without the licence of the said Andrew Atkins, or his heirs or assigns, first had and obtained in writing, and that only for such time, to such person or persons, and in such manner and form as shall in such licence be expressed †; nor shall nor will permit or suffer any person

---

\* As to way-going crops, see the chapter which treats on "*Wrongs in respect to the rights of tenants.*"

† A covenant not to *assign, transfer, set over, or otherwise do or put away the lease or premises*, does not extend to an underlease granted for part of the term. 2 *Blackf.* 766; 3 *Wilson*, 234.

But if a lease contain a proviso, that the lessee, and his administrators, shall not *set, let, or assign over*, the administratrix of the lessee, cannot underlet without incurring a forfeiture. 3 *Ter. Rep.* 425.

Yet if the lessee by will devises the term without the lessor's consent, this will not be a breach of the covenant. *Style*, 483.

And it seems that any assignment by act of law is not a breach of this covenant; as if the lessee become a bankrupt, an assignment by the assignees under his commission is not a breach of covenant. 3 *Wilson*, 236.



or persons to make or use any road or path, other than those which are or shall be lawfully established; or to hunt, course, hawk, set, fowl, or fish in upon or over the said demised premises, or any part thereof; but shall and will, when and as often as required by the said Andrew Atkins, his heirs or assigns, give notice in writing to all and every person and persons to keep off the said demised premises, and not thereafter come into or be found upon the same, or any part thereof. And against such person and persons, or any of them, who shall, after such notice, offend therein, to or for the intent or purpose of making or using a new road or path, or of hunting, coursing, hawking, setting, fowling, or fishing, shall and will at the request, costs and charges of the said Andrew Atkins, his heirs or assigns, commence and prosecute one or more suit or suits at law for the same, and not delay, release, compound, or discontinue the same, or any of them without the consent of the said Andrew Atkins, his heirs and assigns; and the damages which shall be recovered thereby, shall and will pay and apply for and towards the costs, charges, and expenses of such suit or suits. And the said Andrew Atkins, for himself, his heirs and assigns, doth hereby covenant, promise, and agree to and with the said Bartholomew Bell, his executors, administrators, and assigns, in manner and form following, viz. That he the said Andrew Atkins, his heirs or assigns, shall and will allow unto the said Bartholomew Bell, his executors, administrators or assigns, out of the yearly rent hereby reserved, the price at the kiln for four waggon-loads of lime. And also shall and will, with all convenient speed, put the dwelling-house and out-buildings of and on the said demised premises in good and substantial order, condition and repair; and likewise shall and will, from time to time, appoint unto the said Bartholomew Bell, his executors, administrators and assigns, necessary and convenient timber on the stem on the said demised premises, or within two miles thereof, for and towards the repairing of the same, and also reasonable wood from the pollard trees, or elsewhere on the said demised premises, for summer fuel, for

---

So if a lessee who has covenanted not to let, set, assign, transfer, make over, barter, exchange, or otherwise part with the indenture, &c. with a proviso that the landlord may in such case re-enter, gives a warrant of attorney to confess judgment in which the lease is taken in execution and sold, it is no forfeiture of the lease. 8 *Ter. Rep.* 57.

But if a warrant of attorney be given expressly for this purpose, it is in fraud of the covenant, and a forfeiture of the lease. 8 *Term Reports*, 300.

Also covenants may be introduced in a lease to prevent the term passing under a commission of bankrupt, or being taken on an execution against the tenant; and such covenants are now become very usual. 2 *Term Reports*, 133; 8 *Term Reports*, 57, 3.

It is also to be observed that if a forfeiture has been incurred by assignment, and if the lessor accepts rent afterwards, this is a waiver of the forfeiture; but in such case it must appear that at the time he accepted the rent, he knew of the forfeiture incurred. 2 *Ter. Rep.* 430.

Also after a licence to let or assign has been once obtained, either in respect of the whole, or only a part of the premises, the assignee is no longer bound by the covenant, but may afterwards let or assign the whole or any part at pleasure. 4 *Coke*, 119.



the dairy, and for ploughbote, cartbote, and hedgebote as aforesaid. And that he the said Bartholomew Bell, his executors, administrators and assigns, paying, rendering, and performing the several rents, duties, and services hereby reserved, and observing and performing the covenants and agreements herein contained, shall and may peaceably and quietly have, hold, occupy, and enjoy the said demised premises, and every part thereof, without the lawful let, suit, eviction, molestation, or denial of the said Andrew Atkins, his heirs or assigns, or of any person or persons, lawfully or equitably claiming, or to claim by, under, or in trust for him, them, or any of them. PROVIDED ALWAYS, and it is hereby agreed, by and between the parties hereto; and these presents are, upon this express condition, that if all, any, or either of the said yearly or other rents, duties, or services hereby reserved, shall be behind or unpaid, or unperformed wholly or in part by the space of twenty days, next after either of the said days or times, whereon the same ought respectively to be paid or performed; and the same shall be demanded on the expiration of the said twenty days, or at any time afterwards, and not then paid. Or if the said Bartholomew Bell, his executors, administrators or assigns, shall not keep all and singular the said demised premises, in all things in such good and sufficient order, condition, and repair as aforesaid, or shall not pay on demand such sum and sums of money as the said Andrew Atkins, his heirs or assigns, shall lay out and expend in repairing or amending the same as aforesaid, or shall not plant quick from time to time in the dead or decayed parts of the hedges, and preserve and keep from destruction, spoil and damage, the same and the wood, underwood timber, and other trees and saplings, which now are, or hereafter shall be planted or growing on the said demised premises as aforesaid; or if he or they shall not inhabit, or cause to be inhabited as aforesaid, the said dwelling-house, and occupy, manage, manure, and improve the lands and premises, hereby demised in the manner hereinbefore agreed upon, expressed, and laid down, or shall carry off the said demised premises any unthrashed corn or grain, or any hay, straw, fodder, fuel, muck, dung, compost, or other manure, which shall be produced or raised thereon, or let or molest the said Andrew Atkins, his heirs or assigns, or his or their agents, servants, workmen, chapmen, and dealers, or any of them, in the exercise or enjoyment of all or any of the liberties, privileges, matters or things herein before excepted; or shall assign, set, or let the said demised premises, or any part thereof, without such licence as aforesaid, or otherwise than as in such licence shall be expressed, or shall permit or suffer any person or persons to make any road or path, (other than those which are or shall be lawfully established) or to hunt, course, hawk, set, fowl, or fish in, upon, or over the said demised premises, or any part thereof, or shall refuse or neglect to give such notice or notices, or to commence, prosecute, and continue such action or actions at law as aforesaid, at the request, costs, and charges of the said Andrew Atkins, his heirs or assigns, or to pay and apply the damages which shall be recovered thereby for and towards such costs and charges as aforesaid. THAT THEN and from thenceforth, for all or any of the said causes, it shall and may be lawful to and for the said Andrew Atkins, his heirs or assigns, into all and singular the said demised premises, or into any part or parcel thereof, in the name of the whole to re-enter, and the same to have again, re-possess, and enjoy as in his and their first and former estate, anything herein before contained to the contrary thereof in anywise notwithstanding. In witness, &c.



*Form of a Lease for a long Term of Years from the Lord of a Manor, determinable on the Death of the Lessee.*

THIS Indenture made the — day of —, in the — year of the reign of our sovereign lord George the third, by the grace of God of the united kingdom of Great Britain and Ireland, king, defender of the faith and so forth; and in the year of our Lord —, Between Andrew Atkins, of —, of the one part, and Bartholomew Bell, of —, of the other part, WITNESSETH THAT the said Andrew Atkins, as well for and in consideration of the sum of £. — of lawful money of Great Britain, to him in hand well and truly paid by the said Bartholomew Bell, at or before the sealing and delivery of these presents, as and for a fine (the receipt whereof he the said Andrew Atkins doth hereby acknowledge, and thereof and therefrom acquit, release, and discharge the said Bartholomew Bell, his executors and administrators for ever by these presents) as in consideration of the rents, heriots, reservations, covenants, and conditions, herein after reserved, mentioned, and contained, and on the part of the said Bartholomew Bell, his executors, administrators, and assigns, to be paid, rendered, observed, done, and performed, HATH demised, granted, and to farm let and set, and by these presents doth demise, grant, and to farm let and set unto the said Bartholomew Bell, ALL that messuage and tenement called —, with sixty acres of land thereunto belonging, be the same more or less, situate, lying, and being in —, within the parish and manor of —, now in the possession of him the said Bartholomew Bell, or his under-tenants; and all ways, paths, passages, waters, water-courses, easements, profits, commodities, advantages, and appurtenances whatsoever to the said premises hereby demised, belonging or in any wise appertaining, EXCEPT out of this present demise and grant, and always reserved unto the said Andrew Atkins, his heirs and assigns, all and all manner of timber and other trees of what nature or kind soever, and young saplings likely to become timber, pollard and other trees, now standing, growing, or being, or which at any time hereafter shall or may stand, grow, or be in or upon the said demised premises, or any part thereof, with free liberty and full power for the said Andrew Atkins, his heirs and assigns, and all other persons, to be by him or them authorised and empowered to fell, cut down, stub, root, work up, cart, and carry the same away with men and with horses, carts, and carriages, and to sell and dispose of the same at all times and seasons. AND ALSO, except out of this present grant and demise, and always reserved unto the said Andrew Atkins, his heirs and assigns, all coals, seams of coals, mines, minerals, and quarries of stone, beds of sand, gravel, marl, or clay, of what nature or kind soever, which now are, or at any time, and from time to time hereafter, shall or may be found in or upon the said hereby demised premises or any part thereof, with free liberty of ingress, egress, and regress, to and for the said Andrew Atkins, his heirs and assigns, and his and their agents, servants, and workmen, and all others, to be by him or them the said Andrew Atkins, his heirs or assigns authorised to come into and upon the said hereby demised pre-



mises, and every or any part thereof, to work and dig for the said coals, mines, minerals, and quarries of stone, beds of sand, gravel, marl, or clay, and to sell and dispose of whatever may be there found at his and their respective wills and pleasures. AND ALSO to erect fire-engines, and to make waggon-ways, and to use all other inventions of what nature or kind soever, for the winning, working, leading, carrying away, selling and disposing of the same. And also, except out of this present grant and demise, and always reserved unto the said Andrew Atkins, his heirs and assigns, all liberties of hawking, hunting, fishing, fowling, and shooting, and also all fish, wild-fowl, hares, partridges, pheasants, and other game, waifs, estrays, goods and chattels of felons and fugitives, and felons of themselves, deodands, treasure-trove, and all other royalties, casual profits and franchises whatsoever, at any time or times happening or being, or to be used or exercised upon the same premises, TO HAVE AND TO HOLD the said messuage or tenement, and all and singular other the premises hereby demised and granted, or intended so to be with the appurtenances, (except as before is excepted) unto the said Bartholomew Bell, his executors, administrators and assigns, immediately from the — day of —, now last past, for and during the full end and term of ninety-nine years, if he the said Bartholomew Bell shall so long live, yielding and paying therefore, yearly and every year, for and during the continuance of the said term, unto the said Andrew Atkins, his heirs and assigns, the rent or sum of £. — of lawful money of Great Britain, at two half-yearly payments, (that is to say,) on the feasts of the Annunciation of the Blessed Virgin Mary, and Saint Michael the Archangel, by even and equal portions in every year, the first payment thereof to be made on the feast day of the Annunciation of the Blessed Virgin Mary, now next ensuing, and also YIELDING AND PAYING unto the said Andrew Atkins, his heirs and assigns, immediately and after the death and every assignment, surrender and forfeiture of the said Bartholomew Bell, and so likewise of all and every other persons for the time being, who shall be tenant or tenants of the said premises, or any part thereof, by virtue of these presents, the sum of £. —, for and in the name of an heriot or farlieu; and also YIELDING AND PAYING, yearly and every year, during the said term, hereby granted unto the said Andrew Atkins, his heirs and assigns, the sum of £. —, of like money for every acre of meadow or pasture land, part of the premises that has not been tilled, ploughed or broken up, within the space of — years before the day of the date of these presents, which the said Bartholomew Bell, his executors, administrators or assigns, shall plough, break up, or convert into tillage, or cause or suffer to be ploughed, broken up, or converted into tillage, and so in proportion for any greater or less quantity of land than an acre\*, the said last-mentioned rent to be paid on the feast of St.

---

\* It was formerly, and is indeed, by some, still the practice to secure against the conversion of meadow and pasture into arable land, by the reservation of a sum in the nature of a penalty; but there is a distinction to be observed whether the penalty is in the nature of a punishment for default, or whether it is a part of the agreement: thus if there be a covenant not to plough up meadow or pasture land under a penalty of £. — per acre per annum, or the like, there the penalty



Michael the archangel, in every year, without making any deduction or abatement thereof for taxes or on any other account whatsoever, the first payment thereof to be made on the feast of St. Michael the archangel, which shall first happen next after the ploughing or breaking up of the same. AND the said Bartholomew Bell, for himself, his heirs, executors, administrators and assigns, doth hereby covenant, promise, and agree to and with the said Andrew Atkins, his heirs and assigns, that he the said Bartholomew Bell, his executors, administrators and assigns, shall and will well and truly pay, or cause to be paid, unto the said Andrew Atkins, his heirs and assigns, the said yearly rents and heriots, at the days and times, and in manner and form as the same are above reserved and made payable. AND ALSO that he the said Bartholomew Bell, his executors, administrators and assigns, shall and will do his and their suit, service and attendance, at all and every the courts of the said Andrew Atkins, his heirs and assigns, to be holden and kept in and for the manor of ———— afore said, upon such reasonable notice and warning thereof as shall be given to the other tenants of the said manor, and pay and discharge all such fines, pains, and amerciaments, as shall be set, taxed, and imposed upon him and them, as the same shall grow due and be required from time to time, during the continuance of the said term; and shall and will, at their own proper costs and charges, when and as often as occasion shall require, well and sufficiently repair, sustain, uphold, maintain and amend the same demised premises, and every part thereof, as well in houses, walls, coverings, timber, floorings, gates, posts, bars, stiles, hedges, ditches and fences, as in all other needful and necessary reparations and amendments whatsoever, during the continuance of the said term. AND at the end or other sooner determination of the same term, the said premises in good and sufficient tenantable repair, shall and will peaceably and quietly leave and yield up unto the said Andrew Atkins, his heirs and assigns, without doing or suffering to be done thereon any waste, spoil, or destruction. AND ALSO shall and will yearly, on some part of the said demised premises most convenient for the purpose, to be appointed by the said Andrew Atkins, his heirs or assigns, or his or their steward or stewards, for the time being, plant and preserve to grow unto timber, three trees at least, of oak, ash, or elm, or otherwise forfeit and pay unto the said Andrew Atkins, his heirs and assigns, the sum of ———— as a penalty for every tree not planted and preserved according to the true intent and meaning of this present covenant. AND ALSO shall and will, from time to time, and at

---

is by way of punishment, and may be relieved against in a court of equity, namely, in the Court of Chancery or Exchequer. *But if the covenant (and the words yielding and paying operate as such) be to pay £. — per ann. for every acre of meadow ploughed up; this is a part of the agreement between the lessor and lessee, and must be paid.* 4 Burrow's Reports, 2228.

It is therefore the most advisable mode of protecting the lessor against the devastation of meadow and pasture land, to adopt the above form of a reservation of increased rent for every acre broken up or converted into arable ground; as the sum stipulated to be paid in such case may have the effect of a total prohibition.



all times during the continuance of this present demise, permit and suffer his and their name or names to be made use of by the said Andrew Atkins, his heirs and assigns, and his and their steward and stewards for the time being, in discharging or giving notice to any person or persons not to come upon the said demised premises, or any part thereof, to seek for, hawk, hunt, course, chase, disturb, shoot, take, kill, or destroy, any game, fish, or wild-fowl, or to commit any other trespass, damage, or injury there or thereupon; and in commencing and prosecuting, and carrying on any action, suit, or prosecution against any person or persons, for any such trespass, damage, or injury, and shall not nor will disavow or become nonsuit in any such action, suit, or prosecution, or otherwise release and discharge the same. He the said Bartholomew Bell, his executors, administrators and assigns, being indemnified by the said Andrew Atkins, his heirs or assigns, from all costs, charges, and expenses that shall or may be occasioned thereby in anywise. AND ALSO shall and will grind, or cause to be ground, all grist, corn, and grain, that shall happen to be used and spent upon the said demised premises, at the Lord's customary mill, in ————— as aforesaid, or in default thereof shall and will render and pay unto the said Andrew Atkins, his heirs and assigns, for every bushel of such grist or corn that shall not be ground at the said mill \*. PROVIDED ALWAYS, that if the said yearly rents, or any or either of them, or any part or parts of them, any or either of them respectively, or the said heriot or farlieu hereby reserved and made payable, or any or either of them, or any part of them, any or either of them shall be behind, unyielded or unpaid by the space of thirty days next after the same shall become due and payable, according to the reservations aforesaid, and no sufficient distress or distresses shall be found in or upon any part of the said demised premises for levying, and sufficient to answer the same, with the arrears thereof, if any, and all costs and charges to be occasioned by the non-payment, or by the not rendering of the same. Or if the said Bartholomew Bell, his executors, administrators, or assigns, shall give, grant, or assign the said demised premises, or any part thereof, to any person or persons whomsoever, (other than and except to his or their lawful child or children, and that for the whole of the said premises hereby granted) for all or any part of the term hereby granted therein, or for any term or estate by way of underlease exceeding one year, without the licence of the said Andrew Atkins, his heirs or assigns, in writing, under his or their hand or hands first had and obtained †; or if the said Bartholomew Bell, his executors, administrators or assigns, shall give, grant, or assign only part of the said premises, or shall

---

\* If a man is entitled by prescription to have all the corn of the tenants of a certain manor ground at his mill, an action on the case lies against any of the tenants who carry their corn to be ground elsewhere. 2 *Saunders*, 115.

But if a man set up a new mill in the neighbourhood of an antient one, an action will not lie though a damage may from thence accrue to the old mill, for such rivalry is of public benefit and advantage, and the owner's remedy is as above stated against the customary tenants only who may grind there. 1 *Rolle Abr.* 107.

† See page 806 *supra* as to the power of copyholders to grant leases.



give, grant, or assign the whole of the said premises to his or their lawful child or children, and such child or children shall give, grant, or assign the same premises, or any part thereof, to any person or persons whomsoever without the like licence; or if the said Bartholomew Bell, his executors, administrators or assigns, shall do or commit, or suffer to be done or committed in or upon the said demised premises, or any part thereof, any manner of waste\* to the value of £. ————— or above, and shall suffer the same to become ruinous and in decay, to the like value, or above, or shall not, in a substantial manner, repair the same when and as often as occasion shall require, then and from thenceforth, for all or any of the causes aforesaid, it shall and may be lawful to and for the said Andrew Atkins, his heirs and assigns, into and upon the said demised premises, or any part thereof in the name of the whole, to re-enter, and the same to have, again repossess and enjoy, as in his and their former estate and right, this Indenture, or any thing herein contained to the contrary thereof in anywise notwithstanding. AND the said Andrew Atkins, for himself, his heirs and assigns, doth covenant, promise, and agree to and with the said Bartholomew Bell, his executors, administrators and assigns, by these presents, that he the said Bartholomew Bell, his executors, administrators, and assigns, (duly paying the rents above reserved, and yielding such heriot or farlieu as aforesaid, or paying such sum of money in lieu thereof at the election of the said Andrew Atkins, his heirs or assigns, and observing and performing the clauses, exceptions, conditions, provisos, covenants and agreements herein before made and contained, and which, on the part and behalf of the lessee, his executors and administrators, are or ought to be paid, observed, performed, fulfilled and kept), shall and lawfully may peaceably and quietly have, hold, occupy, possess and enjoy, the said hereby demised premises, with the appurtenances, (except as before-mentioned) from henceforth for and during the continuance of the said term hereby granted and demised, without the let, suit, trouble, eviction, disturbance, claim or demand of him the said Andrew Atkins, his heirs or assigns, or any other person or persons lawfully or equitably claiming or to claim, from, by, through, or under him, them, or any of them; PROVIDED NEVERTHELESS, and it is hereby agreed, by and between the said parties hereto, that when and as often as any question shall arise in any court of justice, whether the person or persons on whose death or deaths the term hereby granted is made determinable be living or dead, it shall be incumbent on the person or persons then interested in, or holding or enjoying, or claiming to hold and enjoy the said premises, by virtue of, or under this present demise, to prove such person or persons to be living, to the satisfaction of the said Andrew Atkins, his heirs or assigns; and that in default of such proof, such person or persons shall be deemed and taken to be dead; these presents, or any law, usage or custom to the contrary in anywise notwithstanding. In witness, &c.

---

\* As the question of waste is of some importance, the reader is referred for information on that head to the chapter which treats distinctly upon "*Wrongs in respect to the Rights of Landlords.*"



*Form of a Lease of Lands in Devonshire for a Term of Twenty-one Years, determinable at the End of the first Seven or Fourteen Years, on a Notice from either of the Parties.*

THIS Indenture made, &c. Between Andrew Atkins, of ———, of the one part, and Bartholomew Bell, ———, of ———, of the other part, WITNESSETH, that the said Andrew Atkins, ——— in consideration of the yearly rent hereinafter reserved, and of the covenants, considerations and agreements hereinafter mentioned, expressed and contained, and which on the part and behalf of the said Bartholomew Bell, his executors, administrators, and assigns, are to be kept, done, and performed, HATH demised, leased, set, and to farm let, and by these presents BOTH demise, lease, set, and to farm let, unto the said Bartholomew Bell, ALL that messuage and tenement, with the appurtenances, commonly called or known by the name of ———, situate in ——— aforesaid, now in the possession of the said Bartholomew Bell, his under-tenant or under-tenants, containing by estimation one hundred acres, (be the same more or less) together with all ways, paths, passages, waters, water-courses, profits and advantages whatsoever to the said premises, or any part thereof, belonging or in anywise appertaining, (EXCEPTING and always reserving out of this present demise unto the said Andrew Atkins, his heirs and assigns, all manner of timber and other trees, and saplings likely to become trees, of what kind soever, now standing growing, or being, or which at any time, and from time to time hereafter, shall or may stand, grow, or be planted in or upon the said premises, or any part thereof, with full and free liberty, licence and authority to fell, cut down, root up, convert, draw, take, and carry away the same, with horses, or any manner of carriages or other conveyances, at all seasonable and convenient times during the term hereinafter mentioned, and to make saw-pits for converting such timber-trees on the premises. AND also the right, interest, and privilege of planting trees of every or any sort, on any part of the said hereby demised premises, in or within three feet of the troughs or ditches of the respective hedges of the same premises. AND ALSO the liberty of ingress, egress, and regress, into, from, and upon the said hereby demised premises, or any part thereof, for any or either of the purposes aforesaid, and also to view and see the defects, repairs, and management of the said hereby demised premises or any part thereof). TO HAVE AND TO HOLD the said messuage and tenement hereby demised, or expressed and intended so to be, with the appurtenances, (except as before excepted) unto the said Bartholomew Bell, his executors, administrators, and assigns, from the ——— day of ———, last past, for and during and unto the full end and term of twenty one years from thence next ensuing, fully to be complete and ended, YIELDING AND PAYING therefore, yearly and every year, during the said term, unto the said Andrew Atkins, his heirs and assigns, the rent or sum of £. ———, of lawful money of Great Britain, free and clear of and from all rates, taxes, tythes, charges, impositions and outgoings whatsoever, inclusive of the land-tax\*, (except as hereinafter is ex-

\* Although the lessee covenant to pay rent without deduction or abatement, yet he may deduct the land-tax out of his rent, unless it be expressly mentioned in the lease as one of the taxes which he is to pay. *Cowper* 278.



cepted) at or upon the four most usual feasts or days of payment of rent in the year, (that is to say) the — day of —, the — day of —, the — day of —, and the — day of —, by quarterly payments, by even and equal portions, the first payment thereof to begin and be made on the — day of —, now last past. AND the said Bartholomew Bell DORN, by these presents, for himself, his heirs, executors, administrators, and assigns, covenant, promise and agree to and with the said Andrew Atkins, his heirs and assigns, in manner following, (that is to say) That the said Bartholomew Bell, his executors, administrators or assigns, shall and will well and truly pay or cause to be paid, unto the said Andrew Atkins, his heirs and assigns during the continuance of the said term of twenty-one years hereby demised, the said yearly rent or sum of £. —, at or upon the days or times hereinbefore limited and appointed for the payment of the same, in manner and form aforesaid, according to the true intent and meaning of these presents. AND ALSO that he the said Bartholomew Bell, his executors, administrators or assigns, shall and will, from time to time, and at all times hereafter during the continuance of the said term, repair and keep in good repair all the thatch, floors, doors, gates, stiles, posts, hedges and fences, belonging to the said demised premises, and all other repairs whatsoever (except as hereinafter excepted). And also from time to time, and at all times during the said term, repair and keep in good repair the cyder-mill parcel of the said hereby demised premises, and the screw-press, and all other utensils whatsoever thereunto belonging, or therewith used, and also the glass and lead of the windows, and be at the expense of felling and converting timber, for the purpose of such repairs, after trees fit for that purpose shall have been assigned to him or them by the said Andrew Atkins, his heirs or assigns, on the said demised premises, or any part thereof, or within — miles of the same. AND also keep the several orchards, part of the said premises, well planted during the continuance of the said term, with good young apple-trees, such as the said Andrew Atkins, his heirs or assigns, shall approve of, and dress the same with the usual quantity of dung or ashes, he the said Bartholomew Bell, his executors, administrators, or assigns, having and taking to and for his and their own use and benefit the dead and blown down trees in lieu thereof. AND ALSO that he the said Bartholomew Bell, his executors, administrators or assigns, shall and will, from time to time, and at all times during the continuance of the said term, pay, bear, and discharge all rates, taxes, tythes and charges whatsoever, inclusive of the land tax, which during the continuance of the said term shall become due and payable, for or in respect of the said hereby demised premises, and thereof and therefrom save harmless and keep indemnified the said Andrew Atkins, his heirs, executors, administrators and assigns, and every of them. AND also that he the said Bartholomew Bell, his executors, administrators, or assigns, shall not nor will till or ear or plough or break up to or for tillage, all or any part of the said hereby demised premises, more than once in any seven years, during the continuance of the term hereby granted therein. AND that he the said Bartholomew Bell, his executors, administrators or assigns, shall and will bring into or lay upon every acre of the said hereby demised premises that shall be ploughed up or put to tillage in each seven years of the said term, and so in proportion for every less quantity than an acre, — of good well-burnt



lime, or eight score seams or horse-loads of good black dung, and there mix and spread the same, after the usual and accustomed course of husbandry within the said county of ———. AND that he the said Bartholomew Bell, his executors, administrators, or assigns, shall or will, in each course of tillage, bring or carry into and upon the said hereby demised premises, and there spend and spread abroad, at least ——— of such lime, or ——— seams or horse-loads of such dung in part of the said first-mentioned quantities of lime or dung, before the first crop of each course of tillage shall be taken. AND that he the said Bartholomew Bell, his executors, administrators, or assigns, shall not nor will take from off the said hereby demised premises, or any part thereof, more than three crops of corn or grain, in any seven years during the continuance of the said term; AND that such crops shall be taken severally in successive years, and one after the other, and that one of such crops only, and that not the last, shall be of wheat, and the other two crops barley or oats, or one crop of the one part, and the other crop of the other part. AND that he the said Bartholomew Bell, his executors, administrators or assigns, shall not nor will cut or mow for hay the grass that shall arise from any grass seeds, which shall be sown by him or them more than once after such seeds shall have been sown, and that not for seed, and then only in the next proper season after sowing such grass seeds. AND that he the said Bartholomew Bell, his executors or administrators, shall not nor will cut any wood growing or to grow on the hedges around the arable ground of the said hereby demised premises, at any other time or times but when the fields, fenced by such hedges, shall be in tillage for their first crop of each course of tillage. AND that he the said Bartholomew Bell, his executors or administrators, shall and will, upon or within one calendar month after cutting the wood of any hedge, parcel of the said hereby demised premises, lay, stoop, and plash the hedges from which such wood shall be cut on both sides, according to the usual and accustomed rules of good husbandry, adopted and practised within the said county of ———. AND that he the said Bartholomew Bell, his executors, administrators or assigns, shall not nor will, at any time or times during the continuance of the said term, pare, top, or lop, any tree or trees on the said hereby demised premises, but such as have been usually pared, topped or lopped. AND that he the said Bartholomew Bell, his executors, administrators or assigns, shall not nor will, at any time or times during the continuance of the said term, or after the expiration thereof, remove or carry off, or cause, permit, or suffer to be removed or carried from off the said hereby demised premises, any straw, corn in straw, muck, dung, ashes, soil, compost or manure, that shall arise, grow, or be made on the said premises, or any part thereof; nor shall nor will demise, let, set, or assign the said premises, or any part thereof, to any other person or persons whomsoever, without the leave or licence of the said Andrew Atkins, his heirs or assigns in writing, under his or their hand or hands first had and obtained. AND that he the said Bartholomew Bell, his executors, administrators and assigns, shall not nor will do or commit, or suffer to be done or committed, on the said hereby demised premises, any waste, devastation, spoil, ill management, or bad husbandry whatsoever; but that he the said Bartholomew Bell, his executors, administrators and assigns, shall and will, from time to time, and at all times during the continuance of the said



term, dress, manure, improve and manage, the said hereby demised premises, and every part thereof, according to their several qualities, agreeable to the rules of good husbandry, and according to the custom and usage of the said county of—, and at the end or other sooner determination of the said term, leave and yield up the said hereby demised premises, and every part and parcel thereof, with their appurtenances, so repaired and amended, manured, improved, and managed, into the hands of the said Andrew Atkins, his heirs or assigns, without any notice for that purpose\*. AND the said Andrew Atkins, for himself, his heirs, executors, administrators and assigns, doth, by these presents, covenant and agree with the said Bartholomew Bell, his executors, administrators and assigns, that he the said Andrew Atkins, his heirs or assigns, shall and will, from time to time, and at all times during the said term, repair and keep in repair the main and principal walls, roofs, and coverings, of all such parts of the dwelling-house, barn, cyder-mill-house, and other buildings of the said demised premises as are covered with slate. AND that he the said Andrew Atkins, his heirs or assigns, when thereunto requested by the said Bartholomew Bell, his executors, administrators or assigns, and within one calendar month after every such request, shall and will assign or set out to the said Bartholomew Bell, his executors, administrators or assigns, such tree or trees growing on the said hereby demised premises, as shall or may, in the opinion and judgment of the said Andrew Atkins, his heirs or assigns, be fit and proper for the needful and necessary repairs of the floors, doors, posts, stiles or gates, of the same premises, or the cyder-mill, or any of the implements or utensils therewith used. AND that it shall and may be lawful to and for the said Bartholomew Bell, his executors, administrators and assigns, by and under the due payment of the said rent, and the observance and performance of the said covenants and agreements hereinbefore expressed and contained, and to be observed and kept on his and their parts and behalves, peaceably and quietly to have, hold, use, occupy, possess and enjoy the said

---

\* If a tenant holds over after the expiration of his term he is a tenant by sufferance, and will continue liable to rent: and upon the trial of an action for such subsequent use and occupation of the premises, the original rent, unless there is a new agreement with the landlord, will be the measure of the damages to be given by the jury for such use and occupation.

It is however to be observed, that where a term is to end on a precise day, whether the contract is by deed or writing, or by parol or words only (as in the case of a taking for one year certain, and there is no holding over), there is no occasion for a notice to quit, because both parties are apprised that, unless they come to a fresh agreement, there is an end of the subsisting lease or contract between them; and if the landlord gives notice to his tenant to quit at the expiration of the lease or term, and the tenant holds over, the landlord is entitled to double rent. 1 *Term Reports*, 53.

For by the statute 4 Geo. II, c. 28, s. 1, it is enacted, that if any tenant shall wilfully hold over after the determination of the term, *and after demand made in writing for the delivering the possession thereof*; such person holding over, shall pay double the yearly value of the premises so detained, to be recovered by action of debt, whereunto the defendant shall be obliged to give special bail; against which penalty there shall be no relief in Equity.



messuage and tenement, and all and singular other the hereditaments and premises, hereby demised or expressed and intended so to be, without any let, suit, or interruption of, from or by him the said Andrew Atkins, his heirs or assigns, or any other person or persons whomsoever. AND if it shall happen that the said yearly rent of £. ———, or any part thereof, shall be behind and unpaid by the space of twenty days next after either of the said days of payment on which the same ought to be paid as aforesaid, and the same shall be lawfully demanded on the expiration of the said twenty days, or at any time afterwards, and not paid, and no sufficient distress in or upon the said premises, or some part thereof, by all that time can be found, whereby the said rent so being behind, with the arrears thereof (if any), can or may be levied, satisfied, and paid; or if the said Bartholomew Bell, his executors, administrators or assigns, shall at any time or times during the said term hereby granted, do or commit, or wittingly or willingly suffer to be done or committed, any manner of waste, spoil, or destruction, in or upon the said premises, or any part thereof, to the value of ——— or above, in any one year of the said term, and shall not sufficiently repair or amend, or make satisfaction for the same within three months next after notice or warning thereof in writing shall have been given or delivered unto him or them. THEN and from thenceforth, for any or either of the causes aforesaid, it shall and may be lawful to and for the said Andrew Atkins, his heirs and assigns, into and upon all and singular the said demised premises, with their and every of their appurtenances, to re-enter, and the same to have again, re-possess and enjoy, as in his and their first and former estate, these presents or any thing herein contained to the contrary in anywise notwithstanding. PROVIDED ALWAYS \*, and these presents are upon this condition, nevertheless that it shall and may be lawful to and for either the said Andrew Atkins, his heirs and assigns, or the said Bartholomew Bell, his executors, administrators and assigns, to determine and make void this present demise, at the expiration of the first seven or fourteen years of the said term of twenty-one years hereby granted and demised, on causing notice or warning in writing for that purpose to be given or left for the other of them, his or their heirs, executors, administrators or assigns, at his or their then usual or last place of abode, six calendar months at least before the day or time hereinbefore limited for determining the said term as aforesaid, any thing herein contained to the contrary thereof in anywise notwithstanding. AND it is hereby agreed, by and between the said parties to these presents, and the said Bartholomew Bell doth hereby promise, covenant and grant, that it shall or may be lawful to and for the said Andrew Atkins, his heirs and assigns, in the proper seasons, for the last twelve months, either in the seventh, the

---

\* This proviso creates what is now termed a running lease for seven, fourteen, or twenty-one years, at the option of the parties. And it has been determined, that such a lease gives the lessee a present interest for the first of these terms only, with a springing or future interest after the expiration of such first term, for the next subsequent term, if agreeable to the parties; which the law presumes to be the case, unless half a year's notice be given previous to the expiration of the term in being. 1 Term Reports, 350.



fourteenth, or twenty-first year of the said term of twenty-one years, hereby granted as the case shall require, to make breaches for wheat in or upon any of such acres of the arable ground, part of the said hereby demised premises, as shall be then fallow and out of tillage, and as shall not have been sown with clover and rye or other grass seeds in the preceding year, and break up and prepare the arishes, which shall be in a course of tillage, and sow such arish ground when broken up, and the ground so broken up for wheat with seeds, and hold the part or parts of the said hereby demised premises, which shall be so sown, from the respective times at which the same shall be sown, during the then residue of the said term. In witness, &c.

*Form of a Contract used in Dorsetshire and other Counties in the West of England,  
for letting a Dairy of Cows\*.*

ARTICLES of agreement made and entered into the 10th day of December, in the forty-third year of the reign of our Sovereign Lord George the Third, by the Grace, &c. and in the year of our Lord 1802, BETWEEN Abel Atkins, of Chilthorne Damer, in the county of

\* Not only lands \* and houses may be let for years, but also goods and chattels. *Bacon's Abridg. Tit. Leases, (A.)*

But the interest of the tenant in the latter differs from the interest which he hath in lands or the like; for if one let or lease for years a stock of live cattle, such letting or lease is good, and the tenant shall have the use and profits of them during the term; but yet the owner, or, technically speaking, the lessor, hath not any reversion in them, in like manner as in respect of land, to grant the same over to another, either during the term or after; till the tenant hath re-delivered them to him †; for the lessor or owner hath only a possibility of property in case they all outlive the term; for if any of them die during the term, the lessor or owner cannot have restitution, and during the term he hath nothing to do with them; and consequently of such as die, the property vests absolutely in the tenant. *Ibid.*

So whether they live or die, yet all the young ones coming of them as lambs, calves, or the like, belong absolutely to the tenant, as profits arising and severed from the principal, since otherwise the lessee would pay his rent for nothing.

And therefore this differs from a lease of other dead goods and chattels; for there if any thing be added for the repairing, mending, or improving thereof, the owner or lessor shall have the improvements and additions, together with the principal, after the term is ended, because they cannot be severed without destroying or spoiling the principal. *Ibid.*

But the tenant cannot, in such case, kill, destroy, sell, or give away the individual cattle demised during the term, without being liable to an action. *Ibid.*

\* Land is a general and most comprehensive term in itself, as it includes not only the surface of the earth, but every thing under or over it.

† Therefore, in every such contract there should be a covenant to deliver.



Somerſet, yeoman, of the one part, and Brian Bell, of the ſaid place, dairyman, of the other part, as follows; (that is to ſay),

Fiſt, the ſaid Abel Atkins doth hereby agree with the ſaid Brian Bell, that he the ſaid Brian Bell\* ſhall and may, from the 14th day of February next enſuing the day of the date hereof, to the 14th day of February, which will be in the year of our Lord 1804, poſſeſs and enjoy the cottage or dwelling-houſe, called the Dairy-houſe, near the church, in the pariſh of Chilthorne Domer aforeſaid, and now in the poſſeſſion of him the ſaid Brian Bell, together with the garden thereunto belonging, and the garden ground in the orchard hereinafter mentioned, called Cothays. ALſo that he the ſaid Abel Atkins ſhall and will, from the ſaid 14th day of February next to the ſaid 14th day of February, which will be in the year of our Lord 1804, find, provide, maintain, keep and fodder for and for the uſe and benefit of the ſaid Brian Bell, forty good cows, fit and proper for a dairy, and permit and ſuffer the ſaid Brian Bell, during the term laſt aforeſaid, to have and take the milk, produce and increaſe of the ſaid cows, to and for his own uſe and benefit. And that in caſe any of the ſaid cows ſhall die, or by any accident loſe their milk, or become dry and wholly unprofitable during the term laſt aforeſaid, then, and in either of the ſaid caſes, the ſaid Abel Atkins ſhall either provide other cows in full milk, in the place of thoſe dying or loſing their milk, or make ſuch abatement and allowance out of the rent hereinafter agreed to be paid as ſhall be reaſonable, and is uſual in like caſes, not exceeding ——— [*here the allowance ſhould be ſpecifically mentioned*]; which ſaid cows are to have the ſole and entire paſtorage of all thoſe two cloſes, called Norkhams, containing, by eſtimation, twenty-fix acres; the cloſe called Angels-ground, containing, by eſtimation, nine acres and a half; the cloſe called Higher Barns Cloſe, containing, by eſtimation, fix acres; the cloſe called Long-Yard, containing, by eſtimation, nineteen acres and a half; an orchard called Cothays, containing, by eſtimation, fix acres. A cloſe called Norris's Orchard, containing, by eſtimation, two acres; and a cloſe called Street-Orchard, containing, by eſtimation, three acres. All which lands are ſituate, lying and being in the pariſh of Chilthorne Domer aforeſaid, and are to be hained up for ſuch dairy on the 5th day of April next, and to be ſtocked therewith on the 13th day of May next, or ſooner if the ſaid Brian Bell ſhall be minded. ALſo it is agreed, that the ſaid cows ſhall have the after-graſs of the following cloſes of land (that is to ſay), all that cloſe called Manmead, containing, by eſtimation, twenty-two acres and a half; the cloſe called King's-Ground, containing, by eſtimation, thirteen acres and a half; the cloſe called Dock-Yard and Fiſher's Mead, containing, by eſtimation, twelve acres; and the cloſe called Shortland, containing, by eſtimation, four acres and a half; a cloſe called Five Acres, containing, by eſtimation, five acres; and a cloſe called Ten Acres, containing, by eſtimation, ten acres. Which ſaid laſt-mentioned lands are alſo ſituate in the ſaid pariſh of Chilthorne Domer. ALſo it is agreed that the ſaid cows ſhall have a fortnight's paſtorage in a cer-

\* A tranſmiſſible intereſt may be given to the dairy-man by adding the uſual words, *executors, administrators or assigns*.



tain field called Chilthorne Lease, lying in the said parish, such fortnight to commence at the time of the said last-mentioned field being first stocked.

ALso the said Abel Atkins doth hereby agree that he the said Abel Atkins shall and will permit and suffer the said Brian Bell to keep and depasture a horse, mare, or gelding, on any part of the said premises where the said cows shall be feeding, at any time during the said term, ending as aforesaid, on the 14th day of February 1804. AND if the said Brian Bell shall keep a mare on the said premises, and she shall have a colt, then the said Abel Atkins shall and will permit and suffer the said Brian Bell to keep and depasture such colt with such mare until the 23d day of November next. ALso the said Abel Atkins doth hereby agree, that he the said Abel Atkins shall and will permit and suffer the said Brian Bell to keep pigs in the barton of the farm now in the occupation of the said Abel Atkins, or elsewhere on the said farm, such pigs being properly ringed, and doing no damage to the land, hedges, or apples of the said Abel Atkins. ALso the said Abel Atkins doth hereby agree to allow to the said Brian Bell, such fuel for the use of the said dairy as he can conveniently spare from the said farm, and to carry at his the said Abel Atkins's own expense, such coals as the said Brian Bell may want for the use of the said dairy, from the Mendip Collieries, he the said Brian Bell paying for such coals, and also paying the tolls of the turnpike-gates through which such coals shall be brought. ALso the said Abel Atkins doth hereby agree to allow the said Brian Bell sufficient litter for his pigs, cows, and calves, and also hay for the sucking calves, and also one hoghead of cyder for every twenty hogheads that he the said Abel Atkins shall make, from the said 14th day of February next, during the said term on the said farm. ALso the said Abel Atkins doth hereby agree to carry at his own expense the butter and cheese of the said Brian Bell, the produce of said dairy, either to Bridport in the county of Dorset, or to Honiton in the county of Devon, or to any other place not more distant from Chilthorne Damer aforesaid than Bridport or Honiton aforesaid, at any time or times, at the request of the said Brian Bell. AND the said Abel Atkins doth hereby also agree, that in case all of the said cows shall not have calved by the sixth day of April next, he the said Abel Atkins shall and will allow, out of the rent hereinafter agreed to be paid, at and after the rate of five shillings per cow per week, for each cow that shall not have so calved, until the time that such cow shall drop her calf. AND the said Brian Bell, in consideration of the premises aforesaid, doth, on his part and behalf, agree with the said Abel Atkins, that he the said Brian Bell shall and will well and truly pay or cause to be paid unto the said Abel Atkins, his executors, administrators or assigns, the sum of four hundred pounds of lawful money of Great Britain, as and for the rent, use, and produce of the said forty cows, at the four quarterly payments hereinafter mentioned, that is to say, the first quarterly payment to be made on the 14th day of February next, for which the said Brian Bell is to be allowed the usual interest; the second quarterly payment on the 13th day of May next, the third quarterly payment on the 13th day of August next, and the fourth quarterly payment on the 12th day of November next. AND also that he the said Abel Atkins shall and may, at his will and pleasure, stock



with sheep the said lands, (of which the said Brian Bell is to have the after-grafs) from the 23d day of November next to the end of the said term. Also that he the said Brian Bell shall not nor will keep the said horse, mare, or gelding, in the stable. WITNESS the hands of the said parties, the day and year first written.

The foregoing is taken from a precedent used and approved of in Somersetshire; but *the following covenant seems necessary* to be added from the doctrine laid down in *Bacon's Abridgment* title *Leases*, (A.) respecting contracts for letting of live stock.—See the note \* in p. 1230. supra:

“ And further, that he the said Brian Bell, *his executors, administrators, or assigns*, [if the tenant's interest is intended to be transmissible] shall and will, at the end, expiration, or other sooner determination of the said term, peaceably and quietly leave, surrender and yield up, unto the said Abel Atkins, his executors, administrators, or assigns, all that the said cottage or dwelling-house hereinbefore mentioned, with the garden and garden-ground, land and premises hereinbefore also described;—and also all such cows or milch kine as shall or may be then living and depasturing, or kept and fed in or upon the several closes or parcels of land hereinbefore mentioned and described, or any or either of them, for the then use and benefit of the said Brian Bell, by virtue of these presents. In witness, &c.”

*Form of a Lease for a further Term of Years, before the Expiration of the existing Term, by an Indorsement on the original Demise or Lease\*.*

THIS INDENTURE, &c. BETWEEN the within-named Abel Atkins, of the one part, and the within-named Brian Bell, of the other part, WITNESSETH, That for and in consideration of the rent hereby reserved, and of the covenants, conditions and agreements respectively hereinafter contained, which on the part and behalf of him the said Brian Bell, his executors, administrators and assigns, are to be paid, done, and performed: He the said Abel Atkins DOth demise, lease, and to farm let, unto the said Brian Bell, his executors, administrators and assigns, ALL that piece or parcel of ground, &c. &c. and all and singular other the hereditaments and premises respectively comprised in the within-written Indenture of Lease, and thereby demised in manner therein mentioned, (except as therein is excepted). TO HAVE AND TO HOLD the said piece or parcel of ground, &c. and all and singular other the hereditaments and premises hereby leased, set, and to farm let, or mentioned or intended so to be, (except as aforesaid), unto the said Brian Bell, his executors, administrators, and assigns, from the feast day of ———, which will be in the

\* Where a lease is to be renewed; some expense will be saved by the adoption of this precedent, not only in respect of the stamp duties, but also in necessary professional charges; which may be of some importance where the premises are not very extensive, and consequently of small annual value.



year of our Lord —; and when the term granted and demised in and by the said within-written Indenture of Lease will expire, for and during, and unto the full end and term of 14 years longer from thenceforth next ensuing, and fully to be complete and ended, SUBJECT to and under the like rent, and payable in like manner as is within mentioned, for and in respect of the rent reserved in and by the said within-written Indenture of Lease, and subject to the like power of entry, as well on non-payment of rent as on the happening of any of the other incidents mentioned in the within-written proviso or condition of re-entry. AND IT IS HEREBY DECLARED AND AGREED, by and between the parties to these presents, that they and their respective heirs, executors, administrators and assigns, shall and will by these presents, during the continuance of the additional term of 14 years, hereby granted, stand and be bound for and in respect of the said hereby demised hereditaments and premises, with the appurtenances, in such and the like covenants, conditions and agreements respectively, as they the said parties and their respective heirs, executors, administrators and assigns, do now stand bound in and by the said within-written Indenture of Lease, for and during the now residue to come and unexpired of the within-mentioned term of years, hereby granted, it being the intent and meaning hereof, that this present indorsed Indenture of Lease, and the additional term hereby granted and demised, shall be upon such and the like footing, and all the covenants, clauses, conditions and agreements respectively therein contained, be equally available, take place, and have the like force and effect, to all intents and purposes, as if every article, clause, matter and thing, contained in the said within-written Indenture of Lease, were, word for word, repeated and again inserted in these presents. IN WITNESS, &c.

*The foregoing Indorsement was prepared by the great LORD CAMDEN, while he was Attorney General; and he was of opinion, that it would be just as effectual as a new Lease, if properly stamped.*

*Form of an Assignment of a Lease by Indorsement\*.*

To all to whom these presents shall come, Susannah Bowes, of —, the widow of the within-named Samuel Bowes, and sole executrix named in his last will and testament, sendeth greeting. WHEREAS the said Samuel Bowes, since the execution of the within indenture of lease, departed this life, having first duly made and published his last will and testament in writing, and thereof appointed the said Susannah Bowes sole executrix and universal legatee: AND WHEREAS the within demised premises and indenture of lease were lately put up to sale by public auction; and Richard Giles, of the parish of St. Mary, Islington, having attended at such sale, and offered the sum of eighty-one pounds for the purchase thereof, he was declared

---

\* From the great increase of the stamp duties, an assignment by indorsement, where practicable, is to be recommended.



to be the highest bidder for the same, and the said premises and indenture of lease were accordingly sold to him at and for that sum: Now KNOW YE, that for and in consideration of the sum of eighty-one pounds of lawful money of Great Britain, to the said Susannah Bowes in hand paid by the said Richard Giles, at and before the sealing and delivery of these presents, the receipt whereof is hereby acknowledged; she the said Susannah Bowes hath bargained, sold, assigned, transferred, and set over, and by these presents doth bargain, sell, assign, transfer, and set over unto the said Richard Giles, his executors, administrators, and assigns, all that piece or parcel of ground, and all and singular other the premises in and by the within-written indenture of lease demised, or mentioned or intended so to be, with their and every of their appurtenances; and all the estate, right, title, interest, term of years to come and unexpired, property, claim, and demand whatsoever, either of the within-named Samuel Bowes, or of her the said Susannah Bowes, as executrix or otherwise, of, in, to, or out of the same premises, every or any part or parcel thereof, together with the said indenture of lease. TO HAVE AND TO HOLD the said piece or parcel of ground, and all and singular other the premises hereby, or mentioned to be hereby assigned, with their and every of their appurtenances, unto the said Richard Giles, his executors, administrators, and assigns, from the Feast-Day of the Birth of our Lord Christ, next ensuing the date hereof, for and during all the rest, residue, and remainder, which shall be then to come and unexpired, of the term of sixty-one years, in and by the within-written indenture of lease granted thereof; SUBJECT nevertheless to the payment of the rent and performance of the covenants in the same indenture of lease, respectively reserved and contained on the tenant or lessee's part, from thenceforth to be paid, done, and performed: AND the said Susannah Bowes doth hereby, for herself, her heirs, executors, and administrators, covenant, promise, and agree, to and with the said Richard Giles, his executors, administrators, and assigns, in manner following, (that is to say) —that he the said Richard Giles, his executors, administrators, or assigns, paying the rent, and observing and performing the covenants and agreements reserved and contained in and by the said within-written indenture of lease, on the tenant or lessee's part, to be paid and performed, from and after the said Feast of the Birth of our Lord Christ next ensuing the date hereof, shall and may from time to time, and at all times thereafter, for and during all the residue and remainder which shall be then to come and unexpired of the said term of sixty-one years by the within-written indenture of lease granted, lawfully, peaceably, and quietly have, hold, occupy, possess, and enjoy the said piece or parcel of ground and premises hereby assigned, or intended so to be, with their and every of their appurtenances, and receive and take the rents, issues, and profits thereof, and of every part thereof, to and for his and their own use and benefit, without any lawful let, suit, trouble, denial, eviction, or interruption, of or by the said Susannah Bowes, her executors, administrators, or assigns, or any other person or persons whomsoever, lawfully claiming or to claim, by, from, or under her, them, or any of them, or by or through her or their act, means, neglect, default, or procurement; AND that free and clear, and freely and clearly acquitted and discharged, or otherwise, by the said Susannah Bowes, her executors, or administrators, well and sufficiently saved, kept harmless, and indemnified of, from, and against all and all manner of former and other deeds, gifts, grants,



bargains, sales, assignments, mortgages, surrenders, re-entries, judgments, executions, extents, statutes, recognizances, and all other incumbrances whatsoever; AND of and from all arrears of rent, taxes and assessments, until the said Feast-Day of the Birth of our Lord Christ now next ensuing. AND FURTHER, that she the said Susannah Bowes, her executors or administrators, and all and every other person and persons, having or lawfully claiming, or to claim, any estate, right, title, or interest, of, in, to, or out of the said hereby assigned premises, or any part thereof, from, by, under, or in trust, either for the within-named Samuel Bowes, or for her the said Susannah Bowes, her or any of her executors or administrators, shall and will, from time to time, and at all times during the continuance of the said term hereby assigned, upon every reasonable request, and at the costs and charges in the law of him the said Richard Giles, his executors, administrators, or assigns, make, do, and execute, or cause and procure to be made, done, and executed, all and every such further and other lawful and reasonable acts, conveyances, and assurances in the law whatsoever, for the further, better, and more perfect assigning and assuring the said premises unto the said Richard Giles, his executors, administrators, and assigns, for the then residue of the term within demised, as by the said Richard Giles, his executors, administrators, or assigns, or his or their counsel learned in the law, shall be reasonably devised, or advised and required. IN WITNESS, &c.

*Form of an Agreement for a House and Land; and to grant a Lease at the End of the Term, if required.*

BE IT REMEMBERED that it was this — day of —, in the year of our Lord 1804, mutually agreed, by and between Abel Atkins, of —, of the one part, and Brian Bell, of —, of the other part, in manner and form following; that is to say, HE the said Abel Atkins HATH agreed, and, by this present agreement in writing, BOTH agree to demise and let unto the said Brian Bell, AND the said Brian Bell HATH agreed, and by these presents BOTH agree to take, hold, and enjoy ALL that messuage or tenement, with the garden, orchard, and appurtenances thereunto belonging, situate, lying, and being in the parish of —, in the county of —, now or late in the occupation of —, together with all that field or close of meadow land, containing by estimation 10 acres, little more or less, situate, lying, and being in — aforesaid, called or known by the name of —, now or late in the occupation of —, together with all ways, paths, passages, waters, water-courses, easements, privileges, and advantages whatsoever thereunto belonging, from the — day of —, for and during the term of — years from thence next ensuing; THE said Brian Bell yielding and paying the sum of —, of lawful money of Great Britain, clear of all deductions whatsoever, for or on account of any parliamentary, parochial, or other rates, taxes, or assessments, yearly and every year during the said term, by four equal quarterly payments, on the respective days following; that is to say, the Annunciation of the Blessed Virgin Mary, the Nativity of St. John the Baptist, the Feast of St. Michael the Archangel, and the Birth of our



Lord Christ. AND also yielding and paying, by the said Brian Bell, the said clear yearly sum or rent of ———, in like manner for and during the time that the said Brian Bell shall hold and enjoy the said messuage or tenement and its appurtenances, and the said field or close of meadow land, with its appurtenances, after the expiration of the said term for which they are hereby let, by equal quarterly payments, on the respective days and times aforesaid. AND it is further agreed, that the said Abel Atkins shall, on or before the ——— day of ——— next, put into good and tenantable repair and condition the said messuage or tenement, with its appurtenances; and on or before the day aforesaid put the hedges, fences, mounds, ditches, and watercourses of and in or belonging to the said field or close, in good repair, state, order and condition. IT IS ALSO AGREED, that the said Brian Bell shall for and during the time he shall hold, or occupy and enjoy the same, keep the same messuage or tenement, with its appurtenances, in good and tenantable repair, reasonable use and wear excepted, and maintain, preserve and keep the hedges, fences, mounds, ditches, and watercourses of and in or belonging to the said field or close in good repair, state, order, and condition. AND it is further agreed, that if the said Brian Bell shall or do, at any time or times hereafter, without the authority or licence of the said Abel Atkins for that purpose in writing first had and obtained, underlet or assign over all or any part of the said messuage or tenement and its appurtenances, or all or any part of the said field or close and its appurtenances, to any person or persons whomsoever; IT shall and may be lawful to and for the said Abel Atkins, either by himself or his agent, immediately to re-enter and re-possess, re-occupy and enjoy the said messuage or tenement, with its appurtenances; and also the said field or close of meadow land, and all and singular other the premises hereby demised and let, as if this agreement had never been made or entered into. AND the said Abel Atkins hereby agrees, that if the said Brian Bell shall be minded or desirous to take a lease of the said messuage or tenement, with its appurtenances, and the said field or close of meadow land, with its appurtenances, after the expiration of the said term of ——— years, for the further term of ——— years, at the clear yearly rent of ———, payable quarterly as aforesaid, the said lease to contain the usual and customary covenants, he the said Abel Atkins shall and will, in due form, grant and execute to the said Brian Bell such lease for such further term, at such rent, and payable as aforesaid; the costs and charges of preparing and executing of the said lease to be equally borne, defrayed and discharged by and between the said parties: Provided that the said Brian Bell do and shall give the said Abel Atkins notice in writing, of such his wish or desire, full three calendar months before or prior to the expiration of the said term of years for which the said premises are, by this present agreement, demised and let. As WITNESS our hands the day and year first above written.



## CHAP. III.

*Of the Duration of Leases; and herein of the Means by which they may be determined.*

THE continuation or duration of leases for years ought to be ascertained and fixed, by the particular limitation of the parties, at the time of the lease made; and a lease may be determined, either by the term expiring, for which the premises were leased, or by the happening of a particular contingency; such as by surrender to the landlord, or forfeiture for the breach of some covenant, express or implied.

But the most usual way in which a lease determines, is by the effluxion of time, that is, by the period expiring for which the lands were demised, or upon a contingency happening that was to create, as it were, such period; such as the case of a notice to determine at the expiration of the first seven years of the term, or the like, where a power has been reserved for that purpose.

A lease for years is also determined, and at an end, by what the law terms a *merger* of interest; that is, where the tenant purchases the freehold, or the immediately superior interest of his landlord; then the lease merges or sinks, and is lost or drowned, in the greater estate and interest, which the tenant takes by his purchase.

Another mode, by which a lease may be made to determine, is by surrender; that is, by yielding up to the landlord the lease, and estate and interest derived thereby; by which means the subordinate estate of the tenant is also merged in the greater estate of the landlord.

But by the statute of frauds and perjuries, 29 Car. 2. c. 3. no leases, estates or interests for *term of years* shall be surrendered, unless it be by deed or note in writing, signed by the party who makes such surrender, or some other lawfully authorized thereunto, or by act and operation of law.

A fourth means whereby a lease may be determined, is by cancelling the deed by which it is granted; for, whatever doubts may have been formerly entertained as to the effect of erasing, or otherwise annulling, a lease for years, yet at this day, since the statute of frauds and perjuries, Stat. 29 Car. 2. c. 3. which makes all leases for above three years (Vide this Appendix, p. 802) to have only the force and effect of leases at will, unless they be in writing and signed by the party: the deed or writing, whereby such lease is made, seems to be of the same essence as the lease itself; and therefore the cancelling or destruction of that, seems to destroy and avoid the lease itself, *because it destroys all evidence allowed by law for the support thereof*: though, in such case, Chancery frequently sets up the lease again, or decrees the party to execute a new one for the residue of the term; which is not against the prohibition of the act; because there was once a good and effectual lease made pursuant to the statute. But here it must be understood that the Court of Chancery will not interfere in a fair and *bonâ fide* transaction, but only in cases where the cancel has been obtained by fraud.

A lease may also be determined by force of any condition indorsed on the back of the deed,



if it were so indorsed and signed, before the enfealing and delivery, as well as by force of a condition contained in the body of the deed.

The last mode by which a lease may be determined is by forfeiture; and any act by which the tenant disaffirms or denies the title of his landlord is a forfeiture:

As where he sues out a writ, or resorts to a remedy which claims the freehold or superior estate of his landlord—or where, in an action by his landlord upon the lease or letting of the premises, he defends under the grant of a greater interest in the land, or acknowledges the title to be in a stranger, or attempts to alien or convey in fee.

Also a forfeiture may be incurred by the breach of express or implied covenants; but, as the Courts always lean against forfeitures, the landlord cannot take any advantage of any forfeiture, if he has afterwards done any act that amounts to a waiver of it: however, the forfeiture must in fact be known to the landlord at the time, in order to render his acceptance of rent or any other act a waiver.

#### CHAP. IV.

##### *Of Rent and Taxes.*

THE reservation of rent ought to be certain; for, if a man demise lands, rendering *after the rate* of £. 20 per annum while the lease continues, it will be void: for it does not appear what rent he shall pay in certain, or at what time. And the rent must be reserved to the landlord himself, and not to a stranger.

If the landlord die before the last instant of the rent day, the rent will go along with the land to the heir at law, or to him who is next entitled, and not to the executor or administrator; because the tenant has till the last instant to pay his rent; and consequently, if the landlord die before it is completely due, his executors or administrators can make no title to it.

Where a time certain is appointed for the payment of rent, neither the tenant nor the landlord is bound to attend to any other time; and if the thing be to be done on a day certain, but no hour of the day is set down, wherein the same shall be done, in this case they must attend such a distance of time before sun-set as may be convenient to count the money.

If the landlord enter into any part of the premises demised, the rent is suspended; but if he enter by virtue of a power reserved, or as a mere trespasser, yet if the tenant be not evicted, it will be no suspension of the rent.

The landlord's remedies for the recovery of rent in arrear, are, first, by distress and sale of the goods of the tenant standing on the demised premises; secondly, by action of debt, where the lease is by deed; thirdly, by action of covenant, where the lease is by deed; fourthly, by action of debt or assumpsit, for the use and occupation of the premises where they are not held by deed.

Respecting the liability of the landlord or tenant to pay taxes, whether they be parliamentary taxes or parochial rates, it is a general principle that the occupier of the premises is liable.

But the land-tax acts from the 4th of W. & M. c. 1. s. 13. to the 38th Geo. 3. c. 2. s. 17. & 35. (when the same was made perpetual), direct the tenant to pay the land-tax in the first instance,



and to deduct out of the rent so much of the rate as in respect of the said rent the landlord should and ought to pay and bear; and the landlords, both mediate and immediate, according to their respective interests, are required to allow such deductions.

And under a lease in which rent was reserved to be paid *without any deduction or abatement whatsoever*, it was held that, as the land-tax act enables the tenant to deduct that tax out of his rent, he has in all cases a right to stop it, unless there is an express agreement to the contrary.

The poors rate, also, is a charge upon the occupier, in regard to his possession, and not on the landlord, in regard to the rent received; and if a man does not live within a parish, he is to be assessed according to his land; but if he live within the parish, he is to be rated as dwelling there.

## CHAP. V.

*Of Tithes; and herein of the Manner of setting out and taking the same, conformable to the Statutes and adjudged Cases respecting Tithes.*

TITHES are either *prædial*, *personal*, or *mixt*; and these are divided into *great* or *small* tithes.

1. The PRÆDIAL TITHES are such as arise from the land spontaneously or by manurance; as tithe of corn, hay, wood, herbs, wine, flax, hops—and fruits; such as apples, pears, and the like.

2. MIXT TITHES are such as arise from cattle and beasts receiving their nourishment upon the land; and are therefore due in respect of calves, lambs, kids, pigs, wool, milk, cheese, eggs, and the like.

3. PERSONAL TITHES are the tenth part of the clear gain which is raised from the personal labour of a man, his charges and expenses according to his condition and degree being deducted; but these are only payable in such places as had accustomably for forty years before the stat. 2 and 3 Ed. 6. c. 13. paid personal tithes.

And by that stat. neither day labourers are obliged to pay personal tithes, nor, according to 1 Roll's Abridgment, p. 646, fol. 25, husbandry servants, in respect of their wages.

4. Other ecclesiastical revenues usually considered with tithes, as part of the inheritance of the Church, are oblations or obventions, pensions and mortuaries.

And they are either voluntary, or due by custom at a certain time—as upon marriage, baptism, purification of women, funerals, or the like.

And by the stat. 2 and 3 Ed. 6. c. 13. all who by the laws and customs of the realm ought to pay offerings, shall yearly pay them at the four most usual days, or otherwise at Easter.

5. GREAT TITHES are chiefly of wood, corn, or hay; and SMALL TITHE are in general, unless there has been an immemorial usage to the contrary, all other prædial tithes, besides corn, hay, and wood; and likewise those tithes which are mixed and personal.



6. OF THE PRODUCE OF THE EARTH:—The tithes are to be set out and taken in manner following:

*Wheat and rye*; by the tenth shock, and by the tenth sheaf.

*Barley and oats*; by the tenth cock or shock, and also the tenth sheaf.

*Beans, pease, tares, and all other pulse*; by the tenth cock, heap, or bundle.

*Stubble*; wheat stubble, employed in purposes of husbandry and tillage of the lands of the farm on which it grew, yields no tithe, but if sold or otherwise disposed of, then by the tenth of its value.

*Hay, clover, and other artificial grasses*; by the tenth cock of the first mowing, and also of the second when made into hay.

*After-mowth of grass clover or other artificial grasses*; if eaten by barren and unprofitable stock, by an agistment tithe.

*Hobblings of grass in pasture*; by the tenth cock.

*Seeds of clover, artificial grasses, and also turnip, cole, and rape-seed*; if grown for seed, by the tenth measure of the seed when thrashed out; or if sold, by the tenth of what it sold for,

*Turnips*; if pulled, by every tenth turnip or heap.

*Turnips, rape, and cole*; if eaten, whether by profitable or unprofitable stock, by an agistment tithe; if sold, by the tenth of their value.

*Barren lands*; titheable when cultivated.

*Flax, hemp, and madder*.—The tithes thereof are ascertained at five shillings per acre, and so in proportion for small quantities.

*Wood or woald*; by the tenth heap or gathering.

*Saffron*; by a tenth, when gathered, though only once in three years.

*Hops*; by a tenth part of the whole after picking; that is, after pulled from the bine.

*Potatoes and other roots growing in fields*; by a tenth of their produce when taken up.

*Gardens*; by a tenth of their produce.

*Orchards*; by a tenth of their produce, whether windfalls or gathered.

*Nursery-grounds*. Their produce, whether fruits or plants, indigenous or exotic, if sold in the way of trade, by a tenth, or tenth of their value

*Timber-wood or charcoal*; that is, oak, ash, and elm, above twenty years growth, yield no tithe, except when cut down and sold as fire-wood, or converted into charcoal.

*Other wood*. All other wood of any growth, by a tenth, according to the quantity cut down, whether sold or not, except in counties where timber-wood is scarce, and any other wood is substituted, as beech and the like.

*Osiers and willows*; by the tenth bundle or pole, when cut.

*Underwood*. Underwood, coppice-wood, loppings and toppings of old bowlings, loppings and toppings of trees, reeds, and germins, cut from stumps of trees, though above twenty years growth, by a tenth of their quantity when cut.

*Hedge-rows and gorse or furze*; if sold or not, used upon the farm on which they grow, by every tenth kid or faggot.



7. OF SHEEP. The tithes are to be taken in manner following:

*Lambs*; by every tenth lamb, to be taken away when able to live upon the same food the dam doth; and the tenth of the value of the odd numbers: if sold upon the fall, the tenth of what they sold for: bought in and put to ewes, by an agistment tithe, to be computed from the time of weaning, unless kept until clip-day and clipped.

*Ewes and lambs*; sold or removed out of the parish before clip-day, by an agistment tithe, to be computed from the last clip-day.

*Feeding sheep-shearlings, or hogs bred or bought in*; by an agistment tithe, if sold or removed before clip-day, to be computed from the last clip-day; but if bought in from that day, until sold or removed.

*Sheep*; bought in and kept until clip-day, by the tenth weight of their wool.

*Sheep dying*. Dying after clip-day of the rot or otherwise, whether bought in or bred upon the farm, by an agistment tithe; to be computed from the last clip-day, if bred on the farm; but if bought in, from that time until they died.

*Ewes removed out of the parish to lamb*; by the tenth lamb, according to the number of ewes, and by the tenth of the value for the odd numbers.

*Ewes or other sheep removed out of the parish to be clipped*; by the tenth fleece, according to the number of sheep removed, and by the tenth of the weight of the odd fleeces.

*Wool*; by the tenth weight at the time of clipping.

*Belts and locks*; by the tenth weight when washed and dried.

8. OF BEASTS. The tithes are to be taken in manner following:

*Calves*; by the tenth, if ten; to be taken at the time of weaning, and by a tenth of the value of all above or under ten; if one or more, and sold upon the fall, or fed for the butcher, by the tenth of the price sold for, and in the same manner for all above ten.

*Calves reared for the plough or pail* yield no tithe; but if sold or removed before they are worked or milked, by an agistment tithe, to be computed from the time they become yearlings, until sold or removed.

*Working beasts* yield no tithe while working, unless they work for hire or profit, or are employed in another parish than that in which the owner lives; then by an agistment tithe.

*Beasts turned off to feed*; by an agistment tithe, to be computed from the day turned off until sold or removed.

*Cows sold before calving or dying*; by an agistment tythe, to be computed from the time they were let dry until they were sold or die.

*Beasts bought in and sold again*; by an agistment tithe, to be computed from the day bought in, until sold, except when kept in the straw-yard, and fed with straw; but no exception if fed with hay, though the hay had before paid tithe.

*Milk*; by the whole of the milk milked on each tenth natural day, as well in the morning as in the evening, to be computed from the time the first cow, after calving, is brought to the pail and milked; and so of every cow after calving, and no regard is paid to what they eat.

The cow-keeper is to give notice to the tythe-owner when and where he goes to milk his cows, and the tithe is to be fetched by him from the place where the cows are milked, unless there



be a custom in the parish for the cow-keeper to deliver it to the tithe-owner elsewhere, or at the church porch; and unless he milk his cows in another parish than that in which they are fed; for the tithe of milk is payable to the tithe-owner of the parish in which the cows are fed, and not in that in which they are milked; in which case he is not obliged to fetch it, but the cow-keeper must bring it to the tithe-owner.

9. OF HORSES. The tithes are taken in the following manner:

*Foals*; by the tenth, if ten, to be taken at the time of weaning, and by the tenth of the value of all above or under ten, if sold, before used for the plough, by an agistment tithe, to be computed from the time they become yearlings until sold or removed.

*Horses* kept for working the farm yield no tithe while working; but if used for hire or profit, or employed in another parish than that in which the owner lives, then by an agistment tithe.

*Saddle and pleasure horses*. Saddle horses, and horses used for pleasure only, yield no tithe, but if used for hire or profit, by an agistment tithe.

*Horses turned up or bought to feed for sale*; by an agistment tithe, to be computed from the time turned up or bought in until sold or removed.

*Brood mares and horses* taken in to feed or agist at so much per week, by an agistment tithe for the time kept.

It is to be observed, that the true object of agistment is not the improvement of the animal, but the tenth of what the land is worth to let, for taking in the cattle of another person to agist; and land on which cattle is fed for slaughter should be rated at double the value of the land on which store cattle is fed.

10. OF PIGS, the tithes are to be taken by the tenth pig, if ten, to be taken at the time of weaning, and for all above or under ten, the tenth of the value thereof at weaning.

*Bought in and sold again*, by the tenth of the clear profit thereof.

11. OF RABBITS AND DEER. Rabbits, if sold, by the tenth of both skin and carcase at every killing; and in like manner deer also will yield a tithe, if sold for profit, although *fera naturâ*.

12. OF FISH no tithe is payable, except in certain places by immemorial usage.

13. OF PIGEONS the tithe is taken by the tenth of the value of all pigeons when sold.

*Pigeon manure*, if not used on the farm, but sold, is also titheable by the tenth of the value sold for.

14. OF WILD FOWL taken in decoys and sold for profit, the tithe is taken by the tenth of the value when sold.

15. OF HONEY and WAX the tithe is taken by the tenth measure of honey, and the tenth weight of wax.

16. OF EGGS the tithe is taken by the tenth egg of all turkeys, hens, geese, ducks, or any other domesticated fowl, and by the tenth weight of the feathers of geese.

17. OF MILLS, the tithe of corn-mills shall be paid of the clear yearly gains and profits, after deducting rent, servants' wages, repairs, and other real expences, except of ancient mills erected before the 9th year of Edward the Second.



18. Other PARISH DUES, payable to the minister of the parish, consist of Easter offerings, mortuaries, and surplice fees.

*Easter offerings* are payable for every person in the parish of sixteen years of age and upwards, by the master or mistress of a family, after the rate of two-pence per head.

*Mortuaries* are for every person dying in the parish, possessed of moveable goods to the value of forty pounds and upwards, his debts first paid—10s.

If to the value of thirty pounds, and under forty pounds—6s. 8d.

If to the value of six pounds thirteen and four-pence, and under thirty pounds—3s. 4d.

Except for beneficed clergymen, for whom a mortuary is only due to the bishop of the diocese wherein he held his benefice and resided.

*Surplice fees* are payable for every marriage, whether by license or by banns, for every funeral, and for every churching, according to the custom of the parish.

## CHAP. VI.

### *Of the Highway Duty.*

1. *What persons are compelled to perform statute duty.*] The surveyor, together with the inhabitants and occupiers of lands, tenements, woods, tithes, and hereditaments, within each parish, shall, at proper seasons in every year, use their endeavours for the repair of the highways, and shall be chargeable thereunto, as followeth; that is to say:

Every person keeping a waggon, cart, wain, plough, or tumbrel, and three or more horses or beasts of draught used to draw the same, shall be deemed to keep a team, draught, or plough, and be liable to perform statute-duty with the same, in the parish where he resides, and shall, six days in every year, (if so many shall be found necessary) to be computed from Michaelmas to Michaelmas, send on every day, and at every place, appointed by the surveyor for the amending the highways in such parish, one wain, cart, or carriage, furnished after the custom of the country, with oxen, horses, or other cattle, and all other necessities fit to carry things for that purpose, and also two able men with such wain, cart, or carriage; which duty so performed shall excuse such person from his duty in such parish, in respect of all lands, &c. not exceeding the annual value of £.50, which he shall occupy therein, 34 Geo. III. c. 74. s. 4.

And every person keeping such team, draught, or plough, and occupying in the same parish lands, &c. of the yearly value of £.50 beyond the said yearly value of £.50 in respect whereof such team-duty shall be performed;—and every such person occupying lands, &c. of the yearly value of £.50 in any other parish, besides that wherein he resides:—And every other person not keeping a team, draught, or plough, but occupying lands, &c. of the yearly value of £.50 in any parish,—shall, in like manner, and for the same number of days, find and send one wain, cart, or carriage, furnished with not less than three horses, or four oxen and one horse, or two oxen and two horses, and two able men to each wain, cart, or carriage; and, in



like manner, for every £. 50 *per annum*, which every such person shall further occupy, in such parish, 34 Geo. III. c. 74. f. 4.

Such wains, carts, or carriages, to be employed by the surveyor in repairing the highways within the parish where such lands, &c. lie, 34 Geo. III. c. 74 f. 4.

And every person *who shall not keep a team, draught, or plough*, but shall occupy lands, &c. under the yearly value of £. 50 in the parish where he resides, or in any other parish,—and every person keeping a team, draught, or plough, and occupying lands, &c. under the yearly value of £. 50 in any other parish than that wherein he resides,—shall contribute to the repair of the highways, and pay to the surveyor of such parish, in lieu of such duty, the sums following, viz. “For every 20s. of the annual value of such lands, &c. 1d. for every day’s statute-duty which shall be required and called for by the surveyor of such parish in every year, not exceeding six days duty in the whole; and every such person respectively shall, in like manner, pay 1d. for every 20s. of the annual value of the lands, &c. which he shall occupy in such parish, above the annual value of £. 50, and less than £. 100, and so for every 20s. that each progressive and intermediate annual value of 20s. of the lands, &c. which he shall so occupy, shall fall short of the further increase of £. 50 in every parish where such lands, &c. lie, for every day’s statute-duty required as aforesaid,” 34 Geo. III. c. 74. f. 4.

Which said sums shall be considered as compositions, and shall be paid to the surveyor of the parish in which they are charged, for the use of the highways therein, at the time such compositions are to be paid under stat. 13 Geo. III. c. 78\*, or within ten days after; or in default of such payments, the surveyor shall make application to a justice of the district, who shall summon the party so making default to appear at some special or petty sessions, to be holden for such district, and at which two justices at the least shall be present, to show cause why he has refused or neglected to pay such composition-money; and in default of appearance, or if on appearance he shall not make it appear that he is poor and indigent, and as such is an object deserving of relief; such money shall be levied by distress and sale of the goods of the person refusing to pay the same, as the forfeitures for the neglect in performing the statute-duty are to be levied, 34 Geo. III. c. 74. f. 4.

But when, on application as above mentioned, the justices shall think proper to discharge any poor or indigent person from payment, such person shall, at the same time, be discharged from any expenses arising from his summons and appearance, 34 Geo. III. c. 74. f. 4.

Provided that no person keeping such team, &c. and performing duty with the same, in the parish where he resides, and not occupying lands, &c. within the same, of the yearly value of £. 30, shall be obliged to send more than one labourer with such team, &c. 34 Geo. III. c. 74. f. 4.

But by 42 Geo. III. c. 90, No serjeant, corporal, or drummer of the militia, nor any private man, from the time of his enrolment until his discharge, shall be obliged to perform any highway duty, commonly called statute-work, f. 174.

---

\* For this see 13 Geo. III. c. 78. f. 41. in p. 1248 *infra*.



And if the said teams, draughts, or ploughs, shall not be thought needful by the surveyor, on any of the said days, then such person who should have sent any such team, &c. according to the directions aforesaid, shall, according to the notice to be given, as after directed, send unto the said work, for every one so spared, three able men, there to labour as aforesaid,—or to pay to the said surveyor 4s. 6d. in lieu thereof, 34 Geo. III. c. 74. f. 4.

And it shall be lawful for the surveyor, where the employment for teams is of such sort that two horses will be sufficient for one cart, or where a stand cart with one horse shall be necessary, to call upon any person liable to send a team, draught, or plough, who keeps carts, and three horses, to send such carts, or horses, to perform his statute-duty, as the surveyor shall direct; and the surveyor shall allow every stand cart and one horse as half a team, and every cart and two horses as two-thirds of a team; and if a waggon shall be found necessary for any particular business, the surveyor may require the duty, or part thereof, to be performed with such waggon, by any person who keeps one; which direction shall be observed, or the person liable to perform duty, shall forfeit such sum as the duty required of him shall bear, in proportion to the forfeiture inflicted for every neglect in performing duty with a team, draught, or plough, f. 36.

2. *In what manner the statute duty is to be performed.* The surveyor shall give to, or cause to be left at the abode of every person liable to perform such duty, four days notice at least of the day, hour, and place, upon which each of the days' duty shall be to be performed, 13 Geo. III. c. 78. f. 37.

And all persons shall have and bring with them such shovels, spades, picks, mattocks, and other tools, as are useful, 34 Geo. III. c. 74. f. 2.

And all the said persons and carriages shall diligently perform the work to which they shall be appointed by such surveyor for eight hours in every day, within such parish, or in getting materials in and from any other parish, to be employed in the repair of the highways of the parish, for which they shall perform duty, 34 Geo. III. c. 74. f. 2.

And if any person sending a team shall not send a sufficient labourer besides the driver (except as before mentioned), or if any such labourer or driver, or any other labourer, or the driver of any cart, shall refuse to work, during the time above mentioned, according to the directions of the surveyor; or if any driver shall refuse to carry proper loads, it shall be lawful for such surveyor to discharge such team, cart, or labourer, and to recover from the owner the forfeiture which such person would have incurred, in case no such team, &c. had been sent, 34 Geo. III. c. 74. f. 2.

And every person making default in finding and sending each wain, cart, or carriage, furnished as aforesaid, and such able men with the same, as herein required, or in performing the said duty in manner by this act directed, shall, for every default, forfeit 10s.—For every default in sending a cart with one horse and one man, 3s.—and for not sending a cart with two horses and one man, 5s.—And every person making default in sending such labourer, and every person making default in performing such labour at the time and place, and in manner



directed by this act, or in paying composition-money for the same, shall, for every such neglect, forfeit 1s. 6d.; all which forfeitures shall be applied for the use of the highways within the parish, 13 Geo. III. c. 78. f. 37.

And the surveyor shall equally demand such duty from every person liable, without favour, f. 37.

And if in any parish it shall not be necessary to call forth the whole duty in any year, it shall be abated in proportion amongst all persons liable, f. 37.

And the surveyor shall, with all speed, after default made in performance of such duty, proceed for the recovery of the penalties, as after directed, so that the same may be recovered before he makes up his accounts, f. 37.

*But to prevent as much as possible any inconvenience to persons liable to perform statute-duty, it shall be lawful for the inhabitants of every parish, at some vestry, or public meeting, to appoint three months in every year, within which no statute duty shall be performed, viz. one month in the spring, called the seed month, one month in summer for the hay harvest; and one other month in the summer, for corn harvest: provided notice in writing be given of the times appointed to the surveyor of such parish, and also to the surveyor of every turnpike road within the same, within three days after such meeting, and fourteen days before the beginning of each of such months, f. 43.*

3. *Compositions in lieu of statute-duty.*] Any person liable to perform the said duty, by sending teams, or draughts, or ploughs, with men, horses, or oxen, may compound for the same, if they think fit, by paying to the surveyor, as after mentioned, such money as the justices for the limit wherein such parish shall be, at the special sessions, to be held in the first week after Michaelmas quarter sessions in every year, shall adjudge reasonable, not exceeding six, nor less than three shillings, for each team, draught, or plough for each day; and in default of their adjudging the same, 4s. 6d. in lieu of every day's duty for each team, &c.—and for every cart and one horse, or beast of draught, 2s.—and for every cart and two horses, or beasts of draught, 3s. in lieu of every day's duty, 34 Geo. III. c. 74. f. 3.

*And whereas it may frequently happen, that persons wholly gaining their livelihood by the wages of daily labour, and occupying rateable tenements within a parish, by reason of age, sickness, a numerous family, or misfortune, may be in poor and indigent circumstances, and it may be expedient in certain cases to discharge such persons from all rates, assessments, or compositions whatsoever; it is therefore ENACTED that, on the application of any poor and indigent person to be discharged from the rate or composition made, to any two justices, at any special or petty sessions, held for the limits wherein such poor and indigent person shall reside; the said justices (having first given notice to the surveyor to appear on the part of the parish) shall inquire and examine into the situation and circumstances of the person making such application; and if it shall appear to the satisfaction of such justices that such person is really poor and indigent, and a deserving object of such relief, the said justices may exempt such poor and indigent person from the payment of all rates, assignments, or compositions whatsoever, 34 Geo. III. c. 74. f. 5.*



But if it appear to the justices, at their special sessions, to be held in the week next after Michaelmas quarter sessions, or at any other special or petty sessions, held within the limits of any parish at which two or more justices shall be present, that, from the directions before given for performing and compounding the statute-duty, there will be difficulty in procuring the necessary carriage, or a sufficient number of labourers for the repair of the highways, in any particular parish, within their limits, without paying high prices for the same, it shall be lawful for such justices to order the team duty hereby required, or so much thereof as they think fit, to be performed in kind, within every parish, &c. except in respect of such teams as belong to persons who do not occupy lands, &c. of the annual value of £.30 within the same; and also to order all such persons as shall gain their living by the wages of daily labour, or such part of them as they shall think fit, to perform six days' labour upon such highways in kind, either by themselves or others, in case so many days duty shall be required, upon being paid for such labour the usual wages given to labourers in such parish, 34 Geo. III. c. 74. s. 6.

But if part of such teams or labourers only are required, it shall be directed by the said order of the justices in some given proportion, as one half, third, or fourth part thereof; and the surveyor shall, in that case, at a public vestry for such parish, put the names of all persons liable to send such teams, into one hat or box, and the names of all persons liable to perform such labour into another hat or box, and some inhabitant then present shall draw out such number from each as shall be equal to the proportion ordered by the justices, and the person drawn shall perform such duty in kind for that year; and if such order shall be made or continued in the subsequent year, the same method shall be observed, but the names drawn in the preceding year shall not be put into such hat or box; and in every succeeding year such method shall be observed by such surveyor, so as to render the duty to be performed in kind equal amongst the persons liable thereto; which order of the justices, so far as the same shall be extended, shall supersede the power or liberty of compounding, and shall be binding, and shall continue in force until discharged or varied by the justices at some subsequent special sessions for the highways within such limit, to be held in the week next after Michaelmas quarter sessions, s. 6.

And if any person shall keep a team, and shall not occupy lands, &c. of £.30 per annum, in the parish where he shall reside, but shall in part maintain his horses and beasts of draught used in such team upon lands in adjacent parishes, it shall be lawful for the justices, at some special sessions, to mitigate the duty or composition, as they think just, 13 Geo. III. c. 78. s. 40.

And the surveyor of every parish shall, on some Sunday in November, in every year, cause ten days notice at least to be given in the church or chapel, and if no church or chapel, then at the most public place there, and repeat the like notice in such church, &c. on the next succeeding Sunday, of the time and place when and where the persons permitted, and inclined to compound, may signify to such surveyor their intention to compound; and all persons signifying the same, who shall then, or within one month after, pay to such surveyor the composition, shall be discharged from the performance of such duty, which composition shall be employed by the surveyor for the use of the highways; and no composition shall be permitted, unless paid at the day or within the time aforesaid, s. 41.



But where the occupation of any lands, &c. shall be changed, or any new inhabitant shall come to reside in such parish, &c. after the time appointed for such composition, then the persons occupying such lands, &c. or so residing in such parish, shall be allowed to compound afterwards: provided they pay the composition money within fourteen days after they enter upon such lands, &c. or come to reside in such parish; and every tenant of lands, &c. who intends to quit the possession thereof within six months from the time fixed for making such composition, may compound for half the duty, and the succeeding tenant may compound or perform duty in kind for the other half, 13 Geo. III. c. 78, s. 41.

And if the surveyor shall receive from any person a composition for more duty than shall be required from the other inhabitants within the same parish, for the same year, he shall repay such extraordinary composition to such persons, so as to bring the duty to an equality, amongst all such inhabitants, s. 41.

And in every parish where any person shall keep a draught or plough, and no carriage, he shall pay to the surveyor 1s. for every horse, or pair of oxen or neat cattle, used in such draught, for every day's statute-duty on the day such duty is to be performed, or pay according to the rate aforesaid for the lands, &c. which he shall occupy in such parish, at the option of the surveyor, s. 42.

*"And as by several acts concerning turnpike-roads, part of the statute-duty may be directed to be performed on such roads, and in some places persons liable thereto may have compounded for the same;"* it is therefore enacted, That in such cases, the surveyor of the highways of the parish, where such composition shall have been made, shall pay to the treasurer or surveyor of such turnpike roads, a certain part of the composition-money received, to be proportioned according to the number of days duty which such persons were liable to perform on such turnpike road; which money shall be laid out on such part of the turnpike road as lies within the parish from which it was received, and not elsewhere; and if such surveyor of the highways shall refuse or neglect to pay the same, within twenty days after he shall have received the same, upon demand made by such treasurer or surveyor, the same shall be levied upon the goods of such surveyor, as penalties are by this act to be levied, s. 44.

4. *What persons may be assessed to a rate for defraying the extraordinary charges of such repairs ]—*  
*"As in some parishes there may not be materials for the repair of the highways, by reason whereof the surveyor may be forced to buy materials, and to make recompense for damage done by getting thereof; and as no provision is made for raising a fund to reimburse the expenses thereof, and also such expenses as the said surveyors may incur, by erecting guide-posts, and by making or repairing trunks, tunnels, plats, bridges, or arches, and by rendering satisfaction for damages done to lands for making of new ditches or drains; nor for the salary to be paid by such parish to such surveyors;"* it is therefore enacted, That upon application made by such surveyor to the justices, at their special sessions, and oath made of the money which he hath bona fide laid out, or which will be required for the purposes aforesaid, the said justices, or two of them, shall, by warrant under their hands and seals, cause an assessment to be made upon all occupiers of lands, &c. within such parish, and



the same shall be collected by such persons, and allowed in such manner as the justices, by their order at sessions, shall direct; and the money raised shall be employed and accounted for, according to the direction of the justices; but no such assessment, in one year, shall exceed six-pence in the pound, of the yearly value of the lands, 13 Geo. III. c. 78. s. 30.

Also if upon application of the surveyor of the highways for any parish, to the justices for the limit wherein such parish lieth, at their general or quarter-sessions, or at some special sessions for the highways, the said justices shall be satisfied, by oath, that the duty, and the money authorised to be collected, has been performed, applied, and expended according to this act, or shall be satisfied that the common highways, bridges, causeways, streets, or pavements, belonging to such parish, are so far out of order that they cannot be sufficiently amended, paved, cleansed, and supported, by the means before prescribed (notice being first given of such intended application at the church or chapel, on some Sunday preceding such quarter or special sessions; or if the place be extraparochial, notice in writing being first given of such intended application to some of the principal inhabitants residing in such extraparochial place, a week at least before such sessions); an equal assessment upon all occupiers of lands, &c. within such parish, shall be made and collected by such persons, and allowed in such manner, as the justices, by their order at such sessions, shall direct; and the money thereby raised shall be employed and accounted for, according to the orders of the said justices, towards amending, paving, cleansing and supporting such highways, causeways, streets, pavements and bridges, s. 45.

But the assessment last authorised, and the assessment before authorised, for buying materials, making satisfaction for damages, erecting guide-posts, and paying the surveyor's salary, shall not together, in one year, exceed nine-pence in the pound, s. 46.

And if any person shall refuse or neglect to pay the sums assessed upon him, within ten days after demand, the same may be levied, by the surveyor or persons authorised, by warrant under the hand and seal of one justice, by distress and sale; and in default of distress, it shall be lawful for such justice to commit the person refusing, to the common gaol, there to remain until he shall have paid the sum assessed, and the costs, s. 67.

## CHAP. VII.

### *Of Wrongs in respect to the Rights of Landlords.*

WHATEVER does a lasting damage to the freehold or inheritance is waste; and, in treating thereof, it is to be shewn that it may be committed; FIRST, in respect of houses; SECONDLY, in respect of gardens, orchards, and the like; THIRDLY, in respect of land; FOURTHLY, in respect of timber and other trees.

FIRST, as to *houses*; it is clear, from the stat. Marl. 23, and stat. Glo. 5. that waste may be done in houses: thus, if the tenant pull down the houses demised, it will be waste; so if he suffers a house to be uncovered, whereby the timber decays, though the timber be not thereby



thrown down; so if the house was uncovered at the commencement of the lease, yet it will be waste if he pulls it down without the consent of the landlord; or if it was ruinous at the commencement, and he suffers it to be more ruinous; so if the tenant suffers glass windows to be broke or carried away, or the wainscot, benches, doors, furnaces, or the like, which are fixed to the house, to be removed, although they were originally fixed, by the tenant, by nails, screws, or otherwise. It is also waste if he permits the walls of a house to be decayed for want of plaistering, whereby the timber is rotted—or the chambers of a house, though the timber be not thereby rotted; so if he does not scour a drain, whereby the ground timber is decayed—so it will be waste if the walls are suffered to go to decay, though the timber was in decay at the commencement of the lease; and it will be waste though there be no timber upon the land demised for repairs; or though the house was uncovered by or damaged by tempest, if it be suffered afterwards to remain in decay; so it will be waste if the tenant pulls down the house and rebuilds it less than before, or if he rebuilds it larger to the prejudice of the landlord; for it is more charge to repair. So if the tenant alters the house to the landlord's prejudice; as, if he converts a parlour into a stable, or changes a corn-mill to a cotton- or fulling-mill, or the like. So it may be waste to turn two rooms into one; for if it would be for the lessor's advantage, it may be shewn on the other side. So it will be waste if the tenant builds a new house, and afterwards suffers that to be decayed.

However, in all questions respecting waste it is to be observed that, in regard to the repairs of houses, the tenant is not liable thereto, unless he holds the premises under a lease for a term of years, but the burthen thereof lies on the landlord. Thus, in the case of a tenancy at will, or from year to year, the landlord is under an obligation to keep the premises in tenantable repair; but, where there is an actual lease, the charge of repairing, without any express covenant for that purpose, is upon the tenant, reasonable or ordinary wear and use being allowed.

But, if the house was uncovered at the commencement of the lease, it is no waste if the tenant suffers it to fall into further decay, without pulling it down; or if the walls were uncovered, or insufficiently supported; or if the house was ruinous, and the tenant suffers it to be as it was, without permitting it to become more ruinous. So also it is no waste if the tenant removes furnaces, coppers, or other utensils of trade, though fixed to the freehold, if he removes them before the expiration of his term; but if he permits them to remain after the expiration of the term, he cannot remove them, for they are then vested in the reversioner or landlord.

In like manner green- and hot-houses are removeable; so a barn erected on the premises upon blocks of timber; and this notwithstanding there be a covenant to leave all buildings which then were or should be erected on the premises in repair; for such covenant means that the tenant shall leave all buildings annexed to and become part of the reversionary estate: but if the tenant will actually build, he must leave the buildings for the benefit of the landlord,—thus, if the tenant erect a beasthouse, he cannot remove it; for there is a distinction between erections necessary to the purposes of trade or manufactures, such as hot-houses or the like, and those that are requisite in order to the enjoyment of the land demised, such as beasthouses and the like; and therefore those of the latter description are not removeable by the outgoing tenant, but must remain for the benefit of the inheritance.



SECONDLY; as to *gardens, orchards,* and the like: waste may be committed therein, if the tenant cuts down pear-trees, apple-trees, or other fruit-trees; or if they are thrown down by tempest, and the tenant afterwards roots them up, or cuts down the germens growing, without planting new.

So if the tenant destroys or suffers the stock of a dovecote, warren, park, fish-pond, pool, or the like, to be diminished, or throws down the pales of a park or warren, or stops up the holes of a dovecote, or throws down the banks of a fish-pond. But if the tenant kills or destroys, yet it is no waste if he leaves a sufficient stock.

THIRDLY; as to *land*: it will be waste if the tenant suffers the sea to surround arable land, meadow, or pasture; or if he suffers a wall or bank against the sea, a river, or the like, to be ruinous; by which the water surrounds or overflows the land, and renders it useless: so if he digs up the surface of the land, and carries it away; or if the tenant converts arable to wood, or wood land to arable, it will be waste, or meadow to arable or pasture; or meadow to orchard or hop-ground—though it be done for the amelioration of the soil—or a hop-ground to tillage.

So if a tenant for life or years opens new mines in land, demised without mention of mines, it will be waste; so if he digs for gravel, lime, clay, brick earth, stone, or the like, in pits not open.

But it is not waste if land is surrounded or overflowed by the violence of a tempest, or if pasture be converted to tillage for the improvement of the soil, where it has been sometimes pasture and sometimes arable; or if it was stocked with rabbits, it not being a warren by charter or prescription; so if it was a warren. So it is no waste if the land lies fallow, though it is bad husbandry; or if trenches are dug in a meadow to draw off the water; or if woad or the like be sown against the end of the term, though it is not ripe for several years.

So it is not waste to dig for ore, coal, or the like, in mines open at the time of the lease; or if mines were not demised, if the land was demised with all mines; neither will it be waste for the rector or vicar to dig for or open mines in his glebe.

FOURTHLY; as to *timber and other trees*: it is waste if a tenant cuts down timber: and oak, ash, and elm, are timber after the age of twenty years, throughout the realm; and in some counties, where such timber is scarce, beech, willow, hornbeam, and other trees, may be accounted timber, if they have been so deemed by custom and immemorial usage: And therefore if a tenant cuts down trees, which by law, or the immemorial usage and custom of the country, are esteemed timber, it will be waste; so it will be waste if the tenant does an act by which the timber decays, as if he lops and tops them; so if he cuts down birch, willow, maple, or other trees, which are not timber, if they were growing in defence of the house; or if he roots up or destroys quicksets of white-thorn and the like; so if he extirpates or destroys the germens of underwood, which may be cut. It will also be waste if the tenant cuts down trees for fuel, when there is dead and decayed wood sufficient; or if he cuts down, for new pales, fences, a house, or the like, where none were before; so it is waste if the tenant sells the trees, and with the money repairs, or afterwards re-purchases and uses for repairs; so if he cuts down for repairs which are not necessary, or for repairs when there shall be no occasion, or for repairs which happened by his own default.



But cutting down trees which are not timber, nor stand for the defence of the house, is not waste, nor trees that were timber, when they are dead. So cutting the underwood of oak, ash, willow, or the like, is no waste; so the cutting down bushes, white-thorn, and the like, is no waste; so cutting down timber for necessary *botes*, allowed by law to the tenant, is no waste—as for fuel, plough bote, hedge bote, cart bote, and the like; or for repairs, such as the repair of pales, gates, fences, and the like, though the tenant covenants to repair at his own charge, for this does not take away the liberty which the law allows; so though the landlord covenants to repair; or if it be for the repair of things useful, though they are not absolutely necessary, such as for water-troughs to be fixed in the ground for his cattle.

The remedy of the landlord against the tenant for waste is either under the statute of Gloucester, 6 Ed. I. c. 5; whereby it is enacted, that if tenant for life or years do waste, he shall forfeit the place wasted, and treble damages, or by a special action on the case in nature of waste.

But here it is necessary to observe, that the tenant shall not be sued under the statute for waste, if the value does not amount to 3s. 4d.; and therefore, if waste is found only to the value of 3s. or less, no judgment shall be given, though the defendant confesses the waste; and if judgment is given for the plaintiff, it will be error.

Accordingly, in the case of *Harrow School v. Alderton*, 2 Bos. & Pul. 86.; where, in an action of waste, on the statute of Gloucester, the jury gave only three farthings damages; the defendant had leave to enter up judgment for himself.

## C H A P. VIII.

### *Wrongs in respect of the Rights of Tenants.*

IF there is tenant for life or years of lands, the tenant has no property in the trees growing on the land; and even if the clause in the lease is without impeachment of waste, it gives no property, but is merely an exemption from an action.

Yet if a stranger cuts any down, the tenant may maintain trespass; but he shall not recover damages for the value of the trees, because the property of them is in the landlord.

Also tenants for life, years, or at will, are liable to, or may have an action of trespass, in respect of the *emblements* or *crop*—growing on the lands, on the determination of their estates.

And the doctrine of emblements extends not only to corn sown, but to roots planted, or other annual artificial profits.

Hops growing out of antient roots have been held to be like emblements, which shall go to the husband or executor of the tenant for life, and not to the landlord, and are not to be compared to apples or fruits, which grow of themselves.

But it is otherwise of fruit-trees, grafts, and the like, which are not planted annually at the expense and labour of the tenant, but are either a permanent or a natural profit of the earth.

In some cases, he who sows the corn shall have the emblements; in others not.

Thus, if tenant in fee, or in tail, or in dower, die after sowing the corn, and before severance, his executor or administrator generally shall have the emblements.



For a tenant for life or his representatives shall not be prejudiced by any sudden determination of his estate; because such a determination is contingent and uncertain. But if a man sows land and lets it for life, and the lessee for life die before the corn be severed, his executor shall not have the emblements, but he in reversion; though, if he himself had sowed the land and died, it were otherwise.

The same is also the rule, if a life estate be determined by act of law.

Thus, every one who has an uncertain estate or interest, if, before severance of the corn, his estate determine either by the act of God or of the law, he shall have the emblements, or they shall go to his executor or administrator;—and so it is in all cases regularly, where a man sows land whereof and wherein he hath such an estate as may perhaps continue until the corn be ripe.

But if the estate be determined by the tenant's own act, as by forfeiture by tenant for life for waste committed; or if a tenant during widowhood marries: in these and similar cases, the tenants having thus determined the estates by their own acts, shall not be entitled to take the emblements.

And the under-tenants or lessees of tenants for life have the same, and in some instances greater indulgences than their lessors, the original tenants for life. For the law of estovers and emblements, when the tenant for life is entitled thereto, is also the same with regard to his under-tenant, who represents him and stands in his place: and in those cases where the tenant for life shall not have the emblements because the estate determines by his own act, the exception shall not reach his tenant or lessee, who is a third person.

But with regard to emblements or the profits of lands sowed by tenant for years, there is this difference between him and tenant for life; that where the term of a tenant for years depends upon a certainty, (as if he holds from Midsummer for ten years,) and in the last year he sows a crop of corn, and it is not ripe and cut before Midsummer, the end of his term, his landlord shall have it; for the tenant knew the expiration of his term; and therefore it was his own folly to sow that, of which he never could reap the profits\*. In such case the landlord, it is

---

\* But though this rule is general, yet it admits of certain exceptions, arising from the custom of the country; as, where the plaintiff brought an action of trespass for mowing and taking away a crop of corn, and relied on a custom that the tenant, for any term of years which expired on the 1st of May, might, after the expiration of his term, take and carry away as his way-going crop, all the corn then growing on the land at the time the term expired. This custom was adjudged to be good and reasonable; though it was contended, that the tenant could not claim it against his deed, by which the land had been demised for a certain number of years then expired.

So a custom that the tenant might leave, for a certain time, his way-going crop in the barns of the farm, which he had left after the determination of his term, and after his quitting the premises, is good; and the corn so left may be distrained, even though six months are expired from the end of the term.



said, must enter on the lands, to take the emblements. But where the lease for years depends upon an uncertainty; as upon the death of the lessor or landlord, being himself only tenant for life, or being a husband seised in right of his wife; or if the term of years be determinable upon a life or lives; in all cases of this kind, the estate for years not being certainly to expire at a time foreknown, but merely by the act of God; the tenant, or his executors, shall have the emblements in the same manner that a tenant for life would be entitled thereto. Not so, however, if it determine by the act of the party himself.

If tenant at will sows his land, and the landlord before the corn is ripe, or before it is reaped, put him out, yet the tenant shall have the emblements, and free ingress, egress, and regress, to cut and carry away the profits; and this for the same reason upon which all the cases of emblements turn; namely, the point of uncertainty; since the tenant could not possibly know when his landlord would determine his will, and therefore could make no provision against it; and having sown the land, which is for the good of the public, upon a reasonable presumption, the law will not suffer him to be a loser by it. But it is otherwise, and upon reason equally good, where the tenant himself determines his will; for in this case the landlord shall have the profits of the land.

So in the case of entry of the lessor before sowing, the lessee at will, shall not have the costs of ploughing and manuring.

If a husband holds lands for life, in right of his wife, and sows the land, and afterwards she dies before severance, he shall have the emblements. So where the wife has an estate for years, life, or in fee, and the husband sows the land and dies, his executors shall have the corn.

But if the husband and wife are joint-tenants, though the husband sow the land with corn and die before it be ripe, the wife, and not his executors, shall have the corn, she being the surviving joint-tenant.

Where lands sown are delivered in execution upon an extent, the person to whom they are so delivered shall have the corn on the ground.

The advantages also of emblements are particularly extended to the parochial clergy by the stat. 28 H. VIII. c. 11. which considers all persons who are presented to any ecclesiastical benefice, or to any civil office, as tenants for their own lives, unless the contrary be expressed in the form of the donation: for by this statute, if a parson sows his glebe and dies, his executors shall have the corn; and such parson may by will dispose thereof.

Where there is a right to emblements, ingress, egress, and regress are allowed by law, in order to enter, cut and carry them away, when the estate is determined.

Emblements are distinct from the real estate in the land, and subject to many, though not all the incidents attending personal chattels: they were deviseable by testament before the statute of Wills, and at the death of the owner shall vest in his executor, and not his heir; they are forfeitable by outlawry in a personal action; and by the stat. 11 G. II. c. 19. (though not by the common law) they may be distrained for rent arrear.

But though emblements are affets in the hands of the executor, are forfeitable upon outlawry,



and distrainable for rent, they are not in other respects considered as personal chattels, and in particular they are not at common law the subject of larceny before they are severed from the ground.

This consideration has occasioned the following statutes to be passed for the protection of the occupier of lands as well as the landlord :

1. *Pulling down inclosures.*] By 13 Ed. I. st. 1. c. 46, *where sometimes it chanceth that one having a right to improve, doth then levy a dyke or an hedge, and some by night or at another season, when they suppose not to be espied, do overthrow the hedge or dyke, and it cannot be known by verdict of the assize or jury, who did overthrow the hedge or dyke, and men of the towns near, will not indict such as be guilty of the fact; the towns near adjoining shall be distrained to levy the hedge or dyke at their own cost, and to yield damages.*

And by 3 & 4 Ed. 6. c. 3, *such person as shall bring an assize hereupon, and have judgment to recover, shall have his damages trebled by the judgment of the court.*

2. *Cutting growing corn, robbing of orchards or gardens, breaking hedges, pulling up fruit-trees, or spoiling wood growing.*] By 43 Eliz. c. 7, *if any person shall cut, or unlawfully take away any corn growing, or rob any orchards or gardens, or break or cut any hedge, pales, rails, or fence, or dig, pull up or take up, any fruit-trees, to the intent to take the same away, or shall cut or spoil any woods or underwoods, poles or trees standing (the same not being felony by the laws of this realm), every such person, his procurers and receivers knowing the same, being convicted by confession, or one witness, before one justice of peace, mayor, or other head officer, where the offence shall be committed, or the party apprehended, shall give such recompense for the damages as by such justice shall be appointed, for the first fault; and if such offenders shall be thought, in the discretion of the justice, not able, or do not make satisfaction for the damages, the justice shall commit the offenders to some constable or other inferior officer, where the offence shall be committed, or the party apprehended, to be whipped; and for every such offence for which the offenders shall be afterwards committed, to receive the said punishment of whipping, s. 1.*

And if any constable, or inferior officer, do not, at the command of any such justice, execute by himself, or some other, the punishment limited by this statute, it shall be lawful for the justice to commit him to the common gaol, until the offenders be by him, or by his procurement, whipped, s. 2.

But no such justice shall execute this statute for any offences done unto himself, unless he be assisted with one or more other justices, whom the offence doth not concern, s. 3.

3. *Hedge-breakers and stealers of wood, gates, pales, &c.*] By 15 Car. II. c. 2, *the constable may apprehend, or cause to be apprehended, every person he shall suspect, having or carrying any burden of any kind of wood, underwood, poles, or young trees, or bark, or basts of any trees; or any gates, stiles, posts and pales, rails or hedgewood, broom or furze:—And by warrant of one justice, directed to any officer, such officer shall have power to enter into and search the houses, outhouses, yards, gardens, or other places, belonging to the houses of every person they shall suspect to have any wood, underwood, poles, or young trees, or bark, or basts of any trees; or any gates, stiles, posts, pales, rails, or hedgewood, broom or furze; and where*



they shall find any such, to apprehend the persons suspected, for cutting and taking the same:—And as well those apprehended carrying, as those in whose houses and places the same shall be found, to carry before one justice. And if such person do not then and there give a good account how he came by the same, such as shall satisfy the said justice, or else shall not in some convenient time, to be set by the said justice, produce the party of whom he bought the same; or some credible witness, to depose upon oath such sale thereof, he shall be convicted of cutting and spoiling the same, and punished according to the above statute of 43 Eliz. and further by this act, s. 2.

That is to say, he shall for the first offence give the owner such recompence or satisfaction for damages, and within such time as the justice shall appoint; and over and above pay down presently to the overseers, for the use of the poor, such sum, not exceeding 10s., as the justice shall think meet; and if he do not make such recompence, and also pay the said sum to the poor, the said justice shall commit him to the house of correction for not exceeding one month, or to be whipped by the constable; and if he shall again commit the said offence, and be thereof convicted as before, he shall be sent to the house of correction for one month, to be there kept to hard labour; and if he shall again commit the said offence, and be thereof convicted as before, he shall be deemed an incorrigible rogue, s. 2, 3.

And whosoever shall buy any burdens of wood, or any poles or sticks of wood, or any other the things aforesaid, which may be justly suspected to have been stolen, or unlawfully come by; it shall be lawful for one justice, upon complaint, to examine the matter upon oath; and if he shall find that the same was bought of a person who might justly be suspected to have stolen, or unlawfully come by the same, and that the same was stolen, or unlawfully come by, he may award the party who bought the same, to pay treble value to him from whom it was unlawfully taken; and, in default of present payment, may issue his warrant to levy the same by distress; and in default of distress, to commit the party to gaol, at his own charge, there to remain one month, without bail, s. 4.

But no person shall be punished for any offence upon this law, that hath been punished for the same by any former law; nor unless he be questioned within six weeks after the offence, s. 5.

4. [*Destroying Timber-Trees, Fruit-Trees, or other Trees, or Plantations.*] By 37 Hen. VIII. c. 6. if any person shall maliciously, willingly, and unlawfully bark any apple-trees, pear-trees, or other fruit-trees, he shall forfeit to the party grieved double damages, by action of trespass, at the common law, and also 10l. to the king.

But it is enacted by 1 Geo. I. stat. 2. c. 48. *to encourage the planting of timber-trees, fruit-trees, and other trees in fields, hedge-rows, gardens, walks, and elsewhere, either for ornament, shelter, or profit, and to prevent the malicious destroying or spoiling thereof*; that, if any person shall maliciously break down, cut up, pluck up, throw down, bark, or otherwise destroy, deface, or spoil any timber-tree or trees, fruit-tree or trees, or any other tree or trees, the person damaged shall receive such satisfaction and recompence from the inhabitants of the parish, town, hamlet, vill, or place; to be viewed, and damages and costs to be recovered in the same manner as hedges and ditches overthrown in the night may by the stat. 13 Ed. I. c. 46., unless the party offending shall by such parish or place be convicted of such offence within six months, s. 1.



*And as doubts had arisen on this last act, whether such offences were punishable if committed in the day time, the stat. 6 Geo. I. c. 16. was passed to explain and amend the same, and also to extend the provisions thereof to the destroyers of hedges and other fences: by which said act it is enacted as follows; that is to say:*

If any person whatsoever shall, either *by day or by night*, cut, take, destroy, break, throw down, bark, pluck up, burn, deface, spoil, or carry away any *wood springs, or springs of wood, trees, poles, wood, tops of trees, underwoods, or coppice woods, thorns, or quicksets*, without the consent of the owner of such woods, wood grounds, parks, chaces, or coppices, plantations, timber-trees, fruit-trees, or other trees, thorns, or quicksets, or of the person chiefly entrusted with the care and custody thereof; or shall break open, throw down, level, or destroy any *hedges, gates, posts, styles, railing, walls, fences, dykes, ditches, banks, or other inclosures* thereof; the owner may have such satisfaction and recompence from the inhabitants of the parishes, towns, hamlets, villages, or places joining on such grounds, and recover such damages against such place or places, and in the same manner and form as by the above statute of the 13 Ed. I. c. 46., unless the offender, by such parishes or places, be convicted within six months, 6 Geo. I. c. 16. f. 1.

*But if the offender is known*, then the following proceedings shall take place:

That is to say, if any offender shall, in a riotous, open, tumultuous, or in a secret or clandestine manner, forcibly or wrongfully or maliciously, and without the consent of the owner, or person chiefly entrusted with the care of the above-mentioned premises, commit any of the offences restrained by the said acts of 1 Geo. I. stat. 2. c. 48. or 6 Geo. I. c. 16., two justices, or the justices in sessions, on complaint made by the inhabitants of such parish or place, or by the owner of the wood or trees, or any other, may cause the offender to be apprehended, and hear and determine the offence, and on conviction shall commit the offender to the house of correction to hard labour for three months; and where there is no house of correction, then to the prison for four months; and shall also order the offender to be publicly whipped by the master of such house of correction once a month, during such three months, in the borough or corporation, if the offence be committed therein; or in the market-town where the house of correction stands, or in the next market-town next adjacent to such house of correction, on the market-day: and in the county where such offence shall be committed, on the market-day, between the hours of eleven and two; and where there is no house of correction, the said justices shall order him to be whipped by the common hangman, once a month, during such four months, on the market-day of any borough or corporation, where such offender shall be committed; or on the market-day of some town, between the hours of eleven and two o'clock, 1 Geo. I. stat. 2. c. 48. f. 2. 6 Geo. I. c. 16. f. 2.

And before such offender shall be discharged, he shall find sufficient sureties for his good behaviour for two years, 1 Geo. I. stat. 2. c. 48. f. 3. 6 Geo. I. c. 16. f. 2.

5. [*Destroying Trees growing on Wastes.*] Also by 29 Geo. II. c. 36. if any person shall unlawfully cut, take, destroy, break, throw down, bark, pluck up, burn, deface, spoil, or carry away, any tree, growing in any waste, wood, or pasture, in which any person or body politic hath right of common, every such offender shall be in like manner convicted of such offence, and incur the like penalty as is directed by 6 Geo. I. c. 16. f. 8.



And the parties may take their remedy for damages, either against the parish or place where the offence shall be committed, according to the above acts 1 Geo. I. c. 48, and 6 Geo. I. c. 16. or on the hundred, according to the stat. 9 Geo. I. c. 22. f. 7, as to them shall seem most meet, f. 9.

6. [*Destroying Timber-Trees in Forests or Chaces.*] By 6 Geo. III. c. 48. every person who shall wilfully cut or break down, bark, burn, pluck up, lop, top, crop, or otherwise deface, damage, spoil, or destroy, or carry away, any *timber-tree, or any tree likely to become timber*, or any part thereof, or the lops or tops thereof, without the consent of the owner thereof first had, or in any of his majesty's forests or chaces, without the consent of the surveyor, or his deputy, or person entrusted with the care of the same, and shall be thereof convicted upon the oath of one witness, before one justice, shall, for the first offence, forfeit not exceeding £. 20. together with the charges previous to and attending such conviction, to be ascertained by such justice; and upon non-payment thereof, such justice shall commit the offender to the common gaol, for not exceeding twelve, nor less than six months, or until the penalty and charges be paid;—and if any person so convicted shall be guilty of the like offence a second time, and shall be thereof convicted in like manner, such person shall forfeit not exceeding £. 30, together with the charges attending such conviction; and upon non-payment thereof, such justice shall commit the offender to the common gaol, for not exceeding eighteen, nor less than twelve, months, or until the penalty and charges be paid. And if any person so convicted shall be guilty of the like offence a third time, and shall be thereof convicted, such person shall be guilty of felony, and the court before whom he shall be tried shall transport such person for seven years, f. 1.

And all oak, beech, chesnut, walnut, asp, elm, cedar, fir, ash, lime, fycamore, birch, (*poplar, alder, larch, maple, and hornbeam trees*, 13 Geo. III. c. 33.) shall be deemed timber-trees within the meaning of this act, f. 2.

7. [*Destroying Underwoods, Hollies, or the like.*] Also every person who shall go into the woods, under-woods, or wood-grounds, of any of his majesty's subjects, not being the owner thereof, (or into any of his majesty's forests, or chaces, 9 Geo. III. c. 41. f. 8.) and shall there cut, lop, top, or spoil, split down, or damage, or otherwise destroy, any kind of wood or under-wood, poles, sticks of wood, green stubs, or young trees, or carry or convey the same away, (or *shall by night or day cut down, destroy, take, carry or convey away, any hollies, thorns, or quicksets, there growing or being*, 9 Geo. III. c. 41. f. 8.) or shall have in his custody any kind of wood, under-wood, poles, sticks of wood, green stubs, or young trees, (or *any such hollies, thorns, or quicksets*, 9 Geo. III. c. 41. f. 8.) and shall not give a satisfactory account how he came by the same, and shall be thereof convicted before one justice, on the oath of one witness, shall for the first offence forfeit not exceeding 40s. together with the charges attending such conviction; and if the same be not forthwith paid on conviction, the justice shall by warrant commit him to the house of correction for one month, to hard labour, and to be once whipped there;—and if any person shall commit any of the offences aforesaid a second time, he shall forfeit not exceeding £. 5, together with the charges attending such conviction; and if the same be not forthwith paid on conviction, the justice shall by warrant commit him to the



house of correction for three months, and to be whipped there, once in every one of the said three months; and if a third time, such person convicted thereof shall be deemed an incorrigible rogue, and punished as such, f. 4. 6.

And the justices for the counties, cities, ridings, divisions, or places wherein any offences against this act shall be done, are to put this act in execution, f. 5.

And one moiety of all forfeitures, not otherwise directed, shall go to the informer, and the other to the person aggrieved, f. 8.

And if any person shall hinder, or attempt to prevent, the seizing or securing any person employed in carrying away any such timber, or other trees, such person shall forfeit £.10 to the person who shall convict such offender; and if not paid on conviction, the person convicted shall be committed to the house of correction to hard labour, for not exceeding six calendar months, f. 7.

*And for the better preventing the destruction of timber-trees, and other trees, under-wood, and covert, in forests and chaces,* it is enacted by 4 Geo. III. c. 31. that it shall be lawful for every surveyor of his majesty's woods, and his lawful deputy, and for the officers and keepers of any forest or chace (besides the penalties for destroying the trees or under-wood), to seize and take away for his own use, any saw, axe, hatchet, bill-hook, or other instrument used by any person whom they shall find unlawfully plucking up, sawing, cutting down, topping, lopping, or destroying timber-tree, or other tree, underwood, or covert, within such forest or chace.

8. [*Destroying Plantations, Nurseries, or Gardens.*] Also by the said stat. 6 Geo. III. c. 48. every person who shall pluck up, or cut, spoil, or destroy, or take away, any root, shrub, or plant, out of the fields, nurseries, gardens, or garden-grounds, or other cultivated lands, of any person whomsoever, without the consent of the owner first had, and shall be thereof convicted upon the oath of one witness, before one justice, shall for the first offence forfeit not exceeding 40s. together with the charges previous to and attending such conviction, to be ascertained by such justice; and if the same are not paid down upon conviction, forthwith, the said justice shall by warrant commit him to the house of correction for one month to hard labour, and to be once whipped there;—and if any person so convicted shall again commit the like offence, and be convicted in manner aforesaid, such person shall for such second offence forfeit not exceeding £.5, together with the charges attending the conviction; which if not paid down upon conviction, forthwith, the said justice shall by warrant commit him to the house of correction for three months, and to be whipped there once in every of the said three months. And if any person so before convicted shall a third time commit the like offence, and shall be thereof convicted, such person shall for such third offence be deemed guilty of felony, and the court before whom he shall be tried, shall transport such person for seven years, f. 3. 6.

9. [*Stealing Turnips, Potatoes, Cabbages, Parsnips, Pease, or Carrots growing.*] Also by 13 Geo. III. c. 32. and 42 Geo. III. c. 67. if any person shall steal and take away, or maliciously pull up, injure, or destroy, any turnips, potatoes, cabbages, parsnips, beans, pease, or carrots, growing or being in any garden, lands, or grounds, open or inclosed, and shall be thereof convicted, on a prosecution begun within thirty days after the offence, before any



justice, either by the confession of the party offending, or by the oath of one witness, every person so offending, and being convicted, shall forfeit not exceeding 20s. over the value of the goods stolen, as to such justice shall seem meet; which shall be distributed between the owner of the goods, and the overseers for the use of the poor, in such proportion as such justice shall think fit; or the whole shall be given to the owner or to the overseers, according to the discretion of such justice; and in default of payment, such justice shall commit such offender to the house of correction, to be kept to hard labour for not exceeding two months, unless such penalty be sooner paid, s. 1.

And in all informations, and other proceedings, the evidence of the owner and of the inhabitants of the parish shall be taken, 13 Geo. III. c. 32, s. 2.

But where the conviction shall be upon the oath of the owner, the whole of the penalty shall be paid to the overseer for the use of the poor, s. 3.

10. [*Destroying Timber- or other Trees, or any Roots, Plants, or Shrubs in the Night.*] By 22 & 23 Car. II. c. 7. if any person shall, in the night-time, maliciously, unlawfully, and wittingly destroy any plantations of trees, or throw down any inclosures, he shall forfeit to the party injured treble damages, to be recovered by action of trespass, or upon the case; but upon request of the party injured, three justices of the peace may within six months inquire thereof, as well by a jury, as by examination of witnesses upon oath, or by any lawful ways which to them shall seem meet, s. 5, 6, 7.

And it is enacted by 6 Geo. III. c. 36. that every person who shall *in the night-time* lop, top, cut down, break, throw down, bark, burn, or otherwise spoil or destroy, or carry away any oak, beech, ash, elm, fir, chestnut or asp, timber-tree, or other tree standing for timber, or likely to become timber, without the consent of the owner thereof; or shall *in the night-time* pluck up, dig up, break, spoil, or destroy, or carry away any root, shrub, or plant, roots, shrubs, or plants of the value of 5s. and which shall be growing and being in the garden-ground, nursery-ground, or other inclosed ground of any person; or shall be aiding or assisting therein, or shall buy or receive such root, shrub, or plant, roots, shrubs or plants of the value aforesaid, knowing the same to be stolen, shall be guilty of felony and transported for seven years.

[*Damage Feasant.*] Where an injury has been done by the cattle or goods of any one to the lands of another, he who receives the injury may either distrain them while doing the damage, or bring his action of trespass, and recover for the damage sustained; but he should make his election of his remedy; for if he distrains, and the distress escapes, the action of trespass is gone, unless the escape was not through his fault or neglect; and it is to be observed that this action may be brought against him who has only the care, custody or possession of the cattle which do the damage.

If the tenant's goods are distrained for tolls or customs pretended to be due, he may bring his action for the taking, in which the right to the tolls will be tried.

[*Hunting.*] In respect to injuries from hunting or the pursuit of game, the following points are necessary to be noticed in this place:

Any person may justify going upon the lands of another *in pursuit of ravenous beasts*, as foxes, badgers, and the like: for the taking of them is of public benefit; but he cannot justify to break the ground, or dig for them.



So it will not justify any excessive or unreasonable damage to the land; for the justification is only as to the following, and should be done with as little damage as possible: and therefore if to trespass for such cause, the defendant justifies for following a fox or such beast, and in fact has committed unnecessary mischief, the plaintiff must, in his pleading, newly allege and prove excessive and unnecessary injury.

But in general it is trespass at common law for any man to hunt on another's ground; and the owner or tenant of the soil may maintain his action of trespass for the same.

Yet if the party is qualified according to the statutes to kill game, and the damage found be under 40s. unless the title to the land was chiefly in question, the defendant shall, in such case, pay no more costs than damages.

But for preventing *wilful and malicious trespasses*, the stat. 8 & 9 Will. III. c. 11. s. 4. enacts, that in all actions of trespass wherein, at the trial of the cause, it shall appear and be certified by the judge under his hand on the back of the record that *the trespass upon which any defendant shall be found guilty was wilful and malicious*, the plaintiff shall recover not only his damages, but his full costs of suit.

Under this statute, therefore, if the owner or tenant of the land expressly forewarns another not to come thereon, he will, in an action of trespass, subsequent thereto, be entitled to full costs, notwithstanding the damages recovered be under 40s.; for every trespass is wilful where the defendant has notice, and is especially forewarned not to come on the land.

And if a general notice be given, not to trespass on certain lands, and another hunts over a close belonging to the party giving such notice, the judge on the trial of an action for such trespass is bound under the above stat. 8 & 9 Will. III. c. 11. s. 4. to certify that it was wilful and malicious, in order to entitle the plaintiff to his full costs; notwithstanding it appear on the trial, that the defendant was anxious to avoid trespassing on the ground, and that he made frequent enquiries respecting the plaintiff's boundaries.

[*Gleaning.*] The idea which prevails among the lower classes of the community, that they have a right at common law TO GLEAN OR LEASE in the harvest-fields, is ill founded; for unless there be an immemorial custom or usage in the parish to the contrary, no such right can be claimed by any person whatsoever; and if any one, under such pretended right, enters upon the land of another, the owner or tenant may bring an action of trespass; and even where by immemorial custom or usage such privilege is vested in the poor and indigent parishioners, they can only exercise the right by *gleaning and gathering the ears of corn after the crop is drawn off*.

☞ THE Reader is requested to add to Chapter VI. in this Appendix, which treats of the Highway Duty, viz. in Page 1247—the following Act, which was passed after the Sheet had been worked off.

By the stat. 44 Geo. III. c. 52. so much of the act, 34 Geo. III. c. 74. as relates to the amount of the sums to be paid by persons desirous of compounding for the performance of Statute Duty, is repealed; and in lieu thereof persons MAY COMPOUND by paying to the Surveyor sums of money, as the Special Session held in the first week after the Michaelmas Quarter Session shall adjudge, not exceeding 12s. nor less than 3s. for each team, draught, or plough for each day; and in default of their adjudging the same, 6s. for every day's duty for each; and for each cart with two horses or beasts of draught, not exceeding 8s. nor less than 3s. and in default of their adjudging the same 4s.—and for each cart with one horse or beast of draught, not exceeding 6s. nor less than 2s., and in default of their adjudging the same, 3s.

END OF THE APPENDIX.



# INDEX

## TO THE PRINCIPAL SUBJECTS.

*See also the copious Table of Contents prefixed to each Volume.*

| A                                       |     | PAGE. | D                                       |     | PAGE. |
|-----------------------------------------|-----|-------|-----------------------------------------|-----|-------|
| After Grass .. .. .                     | II. | 948   | Dairies .. .. .                         | I.  | 56    |
| Arable Lands, Cultivation of ..         | I.  | 373   | Dairies for Cheese .. .. .              | ..  | 58    |
| B                                       |     |       | Dairying .. .. .                        | II. | 990   |
| Barns .. .. .                           | ..  | 46    | Ditches .. .. .                         | I.  | 142   |
| Beans .. .. .                           | II. | 590   | Drags .. .. .                           | ..  | 23    |
| Bees .. .. .                            | ..  | 1217  | Draining Boggy Lands .. .. .            | ..  | 291   |
| Bee Stands .. .. .                      | I.  | 68    | ———— Hilly Lands .. .. .                | ..  | 306   |
| Boilers for Vegetables .. .. .          | ..  | 66    | ———— Mixed Soils .. .. .                | ..  | 309   |
| Buck-wheat .. .. .                      | II. | 898   | ———— Retentive Soils .. .. .            | ..  | 312   |
| Buildings, Farm .. .. .                 | I.  | 43    | ———— Mines, Quarries, and Pits ..       | ..  | 327   |
| C                                       |     |       | Drill-Machines .. .. .                  | ..  | 14    |
| Cabbages .. .. .                        | II. | 681   | Drinking-Ponds .. .. .                  | II. | 963   |
| Calves, suckling of .. .. .             | ..  | 978   | Ducks .. .. .                           | ..  | 1211  |
| ———— raising of .. .. .                 | ..  | 979   | E                                       |     |       |
| ———— weaning of .. .. .                 | ..  | 986   | Earth, vegetable, &c. .. .. .           | I.  | 197   |
| Calf Pens .. .. .                       | I.  | 55    | Embankments .. .. .                     | II. | 595   |
| Carrots .. .. .                         | II. | 709   | F                                       |     |       |
| Carts .. .. .                           | I.  | 35    | Fallowing .. .. .                       | ..  | 358   |
| Chalky Soils .. .. .                    | ..  | 187   | Farm-houses .. .. .                     | ..  | 45    |
| Chaff-cutters .. .. .                   | ..  | 32    | Farm-houses and Offices, Situation for  | ..  | 69    |
| Cheese Dairies .. .. .                  | ..  | 58    | Farm-buildings .. .. .                  | ..  | 43    |
| Chicory .. .. .                         | II. | 895   | Farm Servants' Rooms .. .. .            | ..  | 63    |
| Clayey Soils .. .. .                    | I.  | 180   | Feeding-houses and Cow-houses ..        | ..  | 52    |
| Cottages .. .. .                        | ..  | 77    | Fences .. .. .                          | ..  | 107   |
| Clover .. .. .                          | II. | 856   | Fish Ponds .. .. .                      | II. | 1221  |
| Coal- and Wood-houses .. .. .           | I.  | 62    | Flax .. .. .                            | ..  | 733   |
| Cole or Rape .. .. .                    | II. | 702   | Folding Sheep .. .. .                   | I.  | 433   |
| Conveniencies for preparing Cattle Food | I.  | 67    | Food for Cattle, conveniencies for pre- | ..  | 67    |
| Corn Chests .. .. .                     | ..  | ibid. | paring .. .. .                          | ..  |       |
| ———— Stands .. .. .                     | ..  | ibid. | G                                       |     |       |
| Cow-houses and Feeding-houses ..        | ..  | 52    | Gates .. .. .                           | ..  | 143   |
| Cow-keeping .. .. .                     | II. | 967   | Geese .. .. .                           | II. | 1213  |
| Crops, method of Harvesting .. ..       | ..  | 788   | Granaries .. .. .                       | I.  | 47    |
| ———— method of Stacking .. ..           | ..  | 795   | Grasses, Natural .. .. .                | II. | 824   |
| ———— manner of Thrashing them out       | ..  | 802   | ———— Artificial .. .. .                 | ..  | 855   |
| ———— rotation of .. .. .                | ..  | 508   | Grass Lands .. .. .                     | ..  | 903   |
| Cultivation of Arable Lands .. ..       | I.  | 373   |                                         |     |       |



|                                                                   | PAGE.     |                                                          | PAGE.    |
|-------------------------------------------------------------------|-----------|----------------------------------------------------------|----------|
| Gravelly Soils .. .. .                                            | I. 192    | Manures, means of augmenting and pre-<br>serving .. .. . | I. 261   |
| Grazing .. .. .                                                   | II. 1024  | —— General Application of .. .. .                        | 272      |
| Green Crops, ploughing in ..                                      | I. 432    | Manuring Grass Lands .. .. .                             | II. 913  |
| <b>H</b>                                                          |           | —— Tillage Lands .. .. .                                 | I. 418   |
| Harrows .. .. .                                                   | 23 and 24 | Methods of draining Boggy Lands ..                       | 291      |
| Harrowing .. .. .                                                 | 415       | —— of draining Hilly Lands ..                            | 306      |
| Hay-making .. .. .                                                | II. 940   | —— of draining Mixed Soils ..                            | 309      |
| Hemp .. .. .                                                      | 726       | —— of draining Retentive Soils ..                        | 312      |
| Hoes .. .. .                                                      | I. 19     | —— of draining Mines, Quarries,<br>and Pits .. .. .      | 327      |
| Hoeing .. .. .                                                    | I. 496    | Mossy or Peaty Soils .. .. .                             | 194      |
| Hog-sties .. .. .                                                 | 61        | Mowing .. .. .                                           | II. 938  |
| Hogs, diseases of .. .. .                                         | II. 1202  | <b>N</b>                                                 |          |
| Horses .. .. .                                                    | 1170      | Neat Cattle .. .. .                                      | 1117     |
| Hops .. .. .                                                      | 744       | <b>O</b>                                                 |          |
| House-Lamb, suckling .. ..                                        | 1054      | Obstructions to Ploughing, removal of I.                 | 374      |
| Houses, Farm .. .. .                                              | I. 45     | <b>P</b>                                                 |          |
| Houses for Straw .. .. .                                          | 60        | Paling Fences .. .. .                                    | 116      |
| Houses for Roots .. .. .                                          | ibid.     | Paring and Burning .. .. .                               | 335      |
| Houses for Poultry .. .. .                                        | ibid.     | Parsnips .. .. .                                         | II. 718  |
| Houses for Coal and Wood ..                                       | 62        | Pasture Lands .. .. .                                    | 951      |
| Houses for Tools .. .. .                                          | ibid.     | Pease .. .. .                                            | 583      |
| Houses for Pigeons .. .. .                                        | 65        | Peaty or Mossy Soils .. .. .                             | I. 194   |
| <b>I</b>                                                          |           | Pens, Calf .. .. .                                       | 55       |
| Implements employed in the Practice of<br>Husbandry .. .. .       | 2         | Pigeon-houses .. .. .                                    | 65       |
| Inclosing .. .. .                                                 | 99        | Pigeons .. .. .                                          | II. 1215 |
| <b>L</b>                                                          |           | Pigs, diseases of .. .. .                                | 1202     |
| Liquorice .. .. .                                                 | II. 786   | Planting .. .. .                                         | 1059     |
| Live Hedges .. .. .                                               | I. 119    | Ploughs .. .. .                                          | I. 4     |
| Live Stock .. .. .                                                | II. 1100  | —— Swing .. .. .                                         | 5        |
| Loamy Soils .. .. .                                               | I. 184    | —— Wheel .. .. .                                         | 6        |
| Lucerne .. .. .                                                   | II. 875   | Ploughing .. .. .                                        | 409      |
| <b>M</b>                                                          |           | —— in Green Crops .. .. .                                | 432      |
| Madder .. .. .                                                    | 778       | Potatoes .. .. .                                         | II. 600  |
| Mangel wurzel .. .. .                                             | 723       | Poultry .. .. .                                          | 1206     |
| Manures .. .. .                                                   | I. 202    | Poultry-houses .. .. .                                   | I. 60    |
| —— From the Decomposition of Ani-<br>mal Substances .. .. .       | 204       | <b>R</b>                                                 |          |
| —— From the Decomposition of Ve-<br>getable Substances .. .. .    | 216       | Rabbits .. .. .                                          | II. 1203 |
| —— From the Agency and Decom-<br>position of Fossil Substances .. | 224       | Raising of Calves .. .. .                                | 983      |
| —— From the Agency and Decom-<br>position of Saline Substances .. | 246       | Rakes .. .. .                                            | I. 32    |
| —— From the Combination of diffe-<br>rent Substances .. .. .      | 225       | Rape or Cole .. .. .                                     | II. 702  |
|                                                                   |           | Removal of Obstructions to Ploughing I.                  | 374      |
|                                                                   |           | Ridges .. .. .                                           | 398      |
|                                                                   |           | Roads .. .. .                                            | 148      |
|                                                                   |           | —— repairing .. .. .                                     | 163      |
|                                                                   |           | Root-houses .. .. .                                      | 60       |



## 1265

*R. Taylor and Co. Printers, Black-Horse Court, Fleet Street.*



## VALUABLE BOOKS just published

*By RICHARD PHILLIPS, and which are to be had of all Booksellers.*

---

1. A New Edition, in one very large volume, 8vo, price Half a Guinea in boards, of  
**THE FARMER'S KALENDAR**; containing Practical Explanations of the Business necessary to be performed on various Kinds of FARMS during every Month of the Year; with the Principles of various new Improvements, and Instructions for executing them. By ARTHUR YOUNG, Esq. F. R. S., Secretary to the Board of Agriculture, and Honorary Member of many Societies in Europe and America. The plan of this Work is already well known to the public, and has been sanctioned by the rapid sale of four large editions. It had, however, remained out of print several years; but the author has now re-published it, with such considerable improvements and alterations adapted to the present advanced state of agriculture, that it may be justly described as an entirely new and modern Work.

2. On the first Day of every Month continues to be published, price Two Shillings each, a Number of  
**THE ANNALS OF AGRICULTURE**; or, FARMER'S MAGAZINE, consisting of original Papers, Experiments, and Observations, of Accounts of all new Improvements and Discoveries in the Practice of Agriculture, and of Proceedings of Agricultural and other useful Societies, illustrated with copper-plates. By ARTHUR YOUNG, Esq. F. R. S. and Secretary to the Board of Agriculture.

3. In one large and elegant volume, 4to. embellished with fifty-four Copper-plates, thirty-one of which are beautifully coloured, price Three Guineas in boards,

**MODERN LONDON**; being The HISTORY and PRESENT STATE of the BRITISH METROPOLIS, faithfully drawn up from the most authentic materials, and illustrated with a series of highly-finished engravings, on a plan entirely new. It has been the intention of the editors of the present work to exhibit London as it is, and to furnish Englishmen and Foreigners with a systematic, complete, and elegant performance, worthy of being received as a faithful portrait of the greatest city in the world.

4. Complete in twenty-five volumes, embellished with Plates, and illustrated with Maps, Indexes, and Chronological Tables,

**UNIVERSAL HISTORY**, ANCIENT and MODERN, from the earliest Records of Time to the General Peace of 1802. By WILLIAM MAVOR, LL. D. Vicar of Hurley, in Berkshire, Chaplain to the Earl of Moira, &c. &c. There are two editions, which may be had done up in three kinds of binding, at the following prices:

|                            |                  |      |    |   |
|----------------------------|------------------|------|----|---|
| Common Paper .....         | in Boards.....   | £. 4 | 13 | 6 |
| Ditto Ditto .....          | half bound ..... | 5    | 0  | 0 |
| Ditto Ditto .....          | calf gilt .....  | 5    | 15 | 6 |
| Fine and large Paper ..... | in Boards .....  | 6    | 5  | 0 |
| Ditto.....Ditto .....      | half bound ..... | 6    | 16 | 6 |
| Ditto.....Ditto .....      | calf gilt .....  | 7    | 10 | 0 |

In the execution of this extensive and arduous undertaking, through all its parts, the editor has been solicitous to keep at an equal distance from prolixity and brevity. He has studied to be clear, distinct, comprehensive, and exact. To all persons, therefore, who wish to possess, at a moderate expense, a complete Body of **UNIVERSAL HISTORY**, brought down to the present time, to schools in particular, to students, and to circulating and private libraries, the entire work will unquestionably prove a valuable and desirable acquisition.



33. 5















Dickson, R. W.

Practical agriculture; or, a complete system of modern husbandry with the  
methods of planting, and the management of live stock ; in two volumes

Bd.: 2

London (1805)

4 Oecon. 78-2

urn:nbn:de:bvb:12-bsb10228574-2